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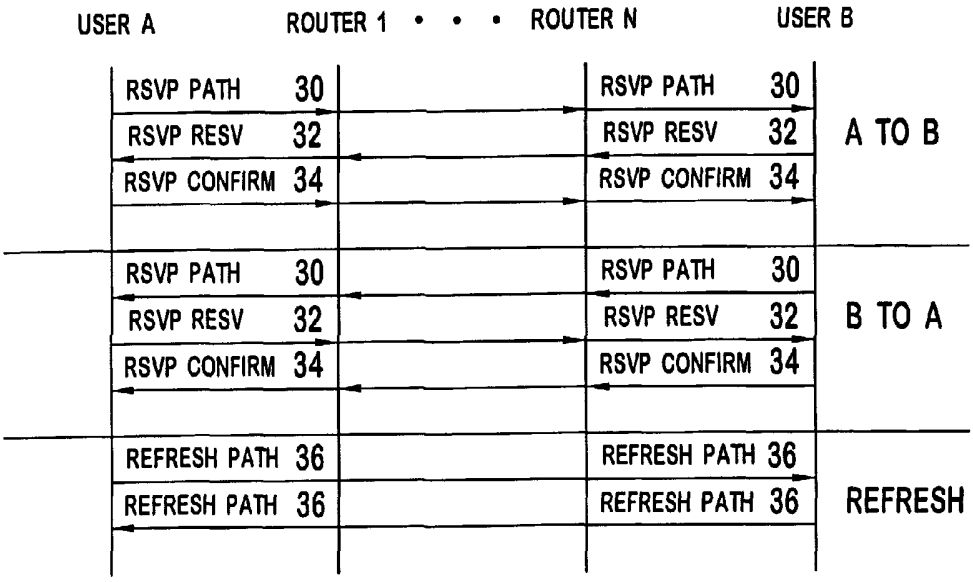
(54) **Title:** BI-DIRECTIONAL AND REVERSE DIRECTIONAL RESOURCE RESERVATION SETUP PROTOCOL



(57) **Abstract:** The invention relates to establishing a wireless packet session between at least two users (USER A and USER B). At least one (USER A or USER B) of the users is a wireless user. A first of the at least two users send a reservation setup protocol (RSVP)PATH message (30) to a second user of the two users. The RSVP PATH message (30) includes information for reserving resources for transmissions from only the first user to the second user; or from the first user to the second user and the second user to the first user, or only for transmissions from the second user to the first user. In response to receiving the RSVP PATH message (30), the second user transmits a RSVP reservation (RESV) message (32) to the first user. Transmissions occur using the reserved resources.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

[0001] # BI-DIRECTIONAL AND REVERSE DIRECTIONAL RESOURCE RESERVATION SETUP PROTOCOL

[0002] ## FIELD OF INVENTION

[0003] The present invention relates to wireless packet based communications. In particular, the invention relates to establishing wireless packet based communications.

[0004] ## BACKGROUND

[0005] For certain Internet applications, resources are reserved to achieve the necessary quality of service (QOS). The reservation of resources allows packet based networks to operate like circuit switched networks. Figure 1 is an illustration of a simplified wireless packet based, such as Internet based, communication session, such as for wireless Internet, wireless multimedia, voice over Internet Protocol, video conferencing or video telephony, between two wireless users, user A and user B. Differing sessions have differing performance requirements, such as setup time, delay, reliability, integrity and quality of service (QOS). User A is shown as user equipment (UE) 20 and user B is shown as UE 22. User A sends and receives communicates via the packet network 28 using its cellular network 24. User B similarly sends and receives communications via the packet network 28 using its cellular network 26.

[0006] Figure 2 is an illustration of establishing such a session. User A sends a resource reservation setup protocol (RSVP) PATH message 30 to establish the session. The RSVP PATH message 30 is sent to user B via various network routers (Router 1 – Router N). Each router determines whether the resources are available for the session. If adequate resources are available, the RSVP PATH message 30 is updated and passed to the next router. If adequate resources are not available, an error message is

sent back to user A. When user B receives the RSVP PATH message 30, user B responds by sending a RSVP reservation (RESV) message 32 to reserve the resources throughout the networks 24, 26, 28. As the RSVP RESV message 32 is sent through the networks, resources are allocated to support the communications from user A to user B. If the resources are successfully allocated, user A receives the RSVP RESV message 32. User A sends a confirmation (RSVP confirm) message 34 to user B to acknowledge receipt of the RSVP RESV message 32.

[0007] To allocate resources for user B's communications to user A, user B sends a RSVP PATH message 30 to user A via various network routers (Router 1 – Router N). When user A receives the RSVP PATH message 30, user A responds by sending a RSVP RESV message 32 to reserve the resources throughout the networks 24, 26, 28. As the RSVP RESV message 32 is sent through the networks 24, 26, 28, resources are allocated to support the communications from user B to user A. If the resources are successfully allocated, user B receives the RESV message 32. User B sends a RSVP confirm message 34 to user A to acknowledge receipt of the RSVP RESV message 34.

[0008] To maintain the resource allocations, Refresh PATH messages 36 are periodically sent through the networks 24, 26, 28. User A sends Refresh PATH messages 36 through the networks 24, 26, 28 to user B to maintain the resources for user A's transmissions and user B sends Refresh PATH messages 36 through the networks 24, 26, 28 to user A to maintain the resources for user B's transmissions. If the Refresh PATH messages 36 are not sent, the reservation states will expire with the allocated resources being released.

[0009] Sending all these messages to allocate resources uses valuable network resources. Accordingly, it is desirable to have alternate approaches to establishing wireless Internet sessions.

[0010] SUMMARY

[0011] The invention relates to establishing a wireless packet session between at least two users. At least one of the users is a wireless user. A first of the at least two users sends a reservation setup protocol (RSVP) PATH message to a second user of the two users. The RSVP PATH message includes information for reserving resources for transmissions from only the first user to the second user; or from the first user to the second user and the second user to the first user, or only for transmissions from the second user to the first user. In response to receiving the RSVP PATH message, the second user transmits a RSVP reservation (RESV) message to the first user. Transmissions occur using the reserved resources.

[0012] BRIEF DESCRIPTION OF THE DRAWING(S)

[0013] Figure 1 is an illustration of simplified wireless packet based communication system.

[0014] Figure 2 is an illustration of establishing a wireless packet session.

[0015] Figure 3 is an illustration of establishing a wireless packet session using bi-directional reservation setup protocol.

[0016] Figure 4 is an illustration of establishing a wireless packet session using reverse direction reservation setup protocol.

[0017] Figure 5 is a simplified illustration of a preferred reservation setup message.

[0018] Figure 6 is a simplified illustration of a preferred forward direction reservation setup message.

[0019] Figure 7 is a simplified illustration of a preferred reverse direction reservation setup protocol message.

[0020] Figure 8 is a simplified illustration of a preferred bi-directional reservation setup protocol message.

[0021] Figure 9 is an illustration of a preferred bi-directional reservation setup

protocol PATH message.

[0022] Figure 10 is an illustration of the SENDER_TSPEC of Figure 9.

[0023] Figures 11 and 12 are illustrations of the ADSPEC of Figure 9.

[0024] Figure 13 is an illustration of a preferred bi-directional reservation setup protocol reservation message.

[0025] Figures 14 and 15 are illustrations of FLOWSPECs of the bi-directional reservation setup protocol reservation message of Figure 13.

[0026] Figure 16 is a simplified block diagram of a wireless user equipment.

[0027] DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0028] Figure 3 is an illustration of bi-directional resource reservation setup protocol. User A desires to setup a bi-directional packet based, such as Internet, session with user B. The requirements, such as bit rate and relative delay, for the session are based on prior negotiations. Both users A and B may be wireless users or one of the two is a wireless user and the other is a wired user. To initiate the session, user A (the originating user) sends a bi-directional RSVP PATH message 38. The bi-directional RSVP PATH message 38 contains resource allocation information for both the communications transmitted from user A to user B and from user B to user A. The preferred format of these communications is discussed in more detail in conjunction with Figures 8, 9, 10, 11 and 12. Although the invention is described primarily in conjunction with two-direction communications, the invention is extendable to any multiple party communications, such as three-way calling.

[0029] The bi-directional RSVP PATH message 38 is send through the various routers (Router 1 – Router N) of the networks to user B. User B sends a bi-directional RSVP RESV message 40 to allocate the resources for both users through the networks 24, 26, 28. A preferred bi-directional RSVP RESV message 40 is described in more detail in conjunction with Figures 8, 13, 14 and 15. Upon transferring the bi-directional RSVP RESV message 40, each network allocates the resources for both user

A's and user B's transmissions. Upon receiving the bi-directional RSVP RESV message 40, indicating that the resources have been successfully allocated, user A sends a bi-directional RSVP confirm message 42 to user B through the networks. Upon receiving the bi-directional RSVP confirm message 42, bi-direction communication between users A and B begins. Preferably, the originating user, user A, is responsible for the session, such as for billing purposes. Making the originating user responsible for the session simplifies billing procedures.

[0030] To maintain the resource allocations, periodically, bi-directional Refresh PATH messages 44 are sent by user A through the networks to user B. Upon transferring the bi-directional Refresh PATH messages 44, the networks maintain the resource allocations for both directions.

[0031] Using the bi-directional messages reduces overhead required for the establishment of the session. Instead of both user A and user B sending RSVP PATH 30, RSVP RESV 32 and RSVP confirm 34 messages, only one user sends bi-directional messages. Although the information carried by each of these messages is typically increased, by reducing the number of messages, the overall network overhead is decreased. Additionally, the bi-directional messaging avoids call scenarios, where the resources in one direction are established and the resources in the other direction are not. The reduced overhead lessens the impact on air resources and improves network performance.

[0032] Figure 4 is an illustration of reverse resource reservation setup protocol. User A desires to setup an Internet session where only user B transmits information. Both users A and B may be wireless users or one of the two is a wireless user and the other is a wired user. To initiate the session, user A (the originating user) sends a reverse direction RSVP PATH message 46. The reverse direction RSVP PATH message 46 contains resource allocation information for user B's transmissions to user A.

[0033] The reverse direction RSVP PATH message 46 is send through the various routers (Router 1 – Router N) of the networks to user B. User B sends a reverse direction RSVP RESV message 48 to allocate the resources for its transmission. Upon receiving the reverse direction RSVP RESV message 48, user A sends a reverse direction RSVP confirm message 50 to user B through the networks 24, 26, 28. Upon receiving the reverse direction RSVP confirm message 50, user B begins transferring data to user A. Preferably, user A (although user A is not transmitting any substantive information) is responsible for the session.

[0034] Figure 5 is an illustration of a simplified preferred RSVP message, illustrating generically the RSVP PATH, RSVP RESV and RSVP confirm messages. The preferred message has an IP header having a direction indicator, (forward, reverse and bi-directional) and having objects 58_1-58_N. Preferably, the message is based on and is backward compatible with RFC 2205 and the direction indicator is a four bit indicator. For RFC 2205, the four bits of the direction indicator 54_1 are assigned the value "0000" for the forward direction (the originating user only sends information). A preferred forward direction RSVP message is shown in Figure 6, with only objects 58_{F1}-58_{FN} for the forward direction, "(FORWARD)", being included. In RFC 2205, each user (each of users A and B) is an originating user. A value "0011" for the direction indicator 54_2 indicates the reverse direction (the originating user only receives information). A preferred reverse direction RSVP message is shown in Figure 7. In Figure 7, all of the objects 58_{R1}-58_{RN} are for the reverse direction, "(REVERSE)". A value "1111" for the direction indicator 54_3 indicates both directions are used (the originating user will receive and send). A preferred bi-directional RSVP message is shown in Figure 8. In Figure 8, both "(FORWARD)" 58_{F1}-58_{FN} and "(REVERSE)" 58_{R1}-58_{RN} objects are present.

[0035] Figure 9 is an illustration of a preferred bi-directional RSVP PATH message compatible with RFC 2205. The bi-directional RSVP PATH message has fields for the "<Path Message>", "<Common Header>", "<INTEGRITY>",

"<SESSION>", "<RSVP_HOP>", "<TIME_VALUES>", "<POLICY_DATA>", "<sender description>", "<sender descriptor>", "<SENDER_TEMPLATE>", "<SENDER_TSPEC>" and "<ADSPEC>".

[0036] Figure 10 is an illustration of a "<SENDER_TSPEC>". Along the top of the figure are numbers indicating the bit positions from bit position 0 to 31. As shown in Figure 10 for a bi-directional RSVP PATH message, both "(Forward)" and "(Reverse)" information is included.

[0037] Two illustrations of the "<ADSPEC>" field are shown in Figures 11 and 12. Figure 11 illustrates a PATH Default ADSPEC and Figure 12 illustrates a PATH Guaranteed Service ADSPEC. As shown in those figures, both ADSPECs contain both forward and reverse information.

[0038] Figure 13 is an illustration of a preferred bi-directional RSVP RESV message compatible with RFC 2205. The bi-directional RSVP RESV message has fields for "<Resv Message>", "<Common Header>", "<INTEGRITY>", "<SESSION>", "<RSVP_HOP>", "<TIME_VALUES>", "<RESV_CONFIRM>", "<SCOPE>", "<POLICY_DATA>", "<STYLE>", "<flow descriptor list>" and "<flow descriptor>".

[0039] The direction indicator is included in the "<flow descriptor list>". Two illustrations of preferred FLOWSPECs of the "<flow descriptor list>" are shown in Figure 14 and 15. Figure 14 is a FLOWSPEC for Guaranteed service and Figure 15 is a FLOWSPEC for Guaranteed Service Extension Format. As shown in Figures 14 and 15 for a bi-directional RSVP RESV message, both forward and reverse direction information is carried by the message.

[0040] Figure 16 is a block diagram of a wireless user equipment for use in bi-directional, reverse direction and forward direction reservation setup protocol messaging. A RSVP message generator 72 produces the RSVP PATH messages (including bi-directional RSVP and reverse direction RSVP PATH messages), RSVP RESV messages (including bi-directional RSVP and reverse direction RSVP RESV messages), RSVP Confirm messages (including bi-directional RSVP and reverse

direction RSVP Confirm messages) and Refresh PATH messages (including bi-directional and reverse direction Refresh Path messages). A RSVP receiver is used to receive the various RSVP messages. The messages that the UE transmits or receives is based on the whether the UE is the originating user or non-originating user, as previously described.

[0041] Session data is transmitted and received using a session data transmitter 76 and a session data receiver 78. An antenna 70 or antenna array are used to radiate and receive the various messages and communications across the air interface.

* * *

CLAIMS

What is claimed is:

1. A method for establishing a wireless packet based session between at least two users, at least one of the two users being a wireless user, the method comprising:

a first of the at least two users sending a reservation setup protocol (RSVP) PATH message to a second user of the two users, the RSVP PATH message includes information for reserving resources for transmissions from the first user to the second user and for reserving resources for transmissions from the second user to the first user;

in response to receiving the RSVP PATH message by the second user, the second user sending a RSVP reservation (RESV) message to the first user, as the RSVP RESV message is sent through at least one packet based network, resources for the transmissions from the first and second user being reserved; and

the first and second users transmitting session information utilizing the reserved resources.

2. The method of claim 1 further comprising in response to receiving the RSVP RESV message by the first user, the first user sending a RSVP Confirm message to the second user to confirm receipt of the RSVP RESV message.

3. The method of claim 1 wherein the first and second users each being wireless users.

4. The method of claim 1 wherein the first user is a wireless user and the second user is a wired user.

5. The method of claim 1 wherein the first user is a wired user and the second user is a wireless user.

6. The method of claim 1 wherein the RSVP PATH message includes a direction indicator indicating the RSVP PATH message comprising information for reserving resources for the first and second users' transmissions.

7. The method of claim 6 wherein the direction indicator is a four bit indicator.

8. The method of claim 6 wherein the direction indicator has a value of "1111" to indicate that the information for reserving resources for the first and second users' transmissions is included.

9. The method of claim 1 wherein the first user is responsible for the session.

10. The method of claim 1 wherein the first user is billed for the session.

11. A method for establishing a wireless packet based session between at least two users, at least one of the two users being a wireless user, the method comprising:

a first of the at least two users sending a reservation setup protocol (RSVP) PATH message to a second user of the two users, the RSVP PATH message includes information for reserving resources for transmissions from the second user to the first user and not information for transmissions for the first user to the second user;

in response to receiving the RSVP PATH message by the second user, the second user sending a RSVP reservation (RESV) message to the first user, as the RSVP RESV message is sent through at least one packet based network, resources for the transmission for the second user being reserved; and

the second user transmitting session information utilizing the reserved resources.

12. The method of claim 11 further comprising in response to receiving the RSVP RESV message by the first user, the first user sending a RSVP Confirm message to the second user to confirm receipt of the RSVP RESV message.

13. The method of claim 11 wherein the first and second users each being wireless users.

14. The method of claim 11 wherein the first user is a wireless user and the second user is a wired user.

15. The method of claim 11 wherein the first user is a wired user and the second user is a wireless user.

16. The method of claim 11 wherein the RSVP PATH message includes a direction indicator indicating the RSVP PATH message comprising information for reserving resources for the first and second users' transmissions.

17. The method of claim 16 wherein the direction indicator is a four bit indicator.

18. The method of claim 17 wherein the direction indicator has a value of "0011" to indicate that the information for reserving resources is only for the second user's transmissions.

19. The method of claim 11 wherein the first user is responsible for the session.

20. The method of claim 11 wherein the first user is billed for the session.

21. A wireless user equipment for use in initiating a packet based session, the user equipment comprising:

a reservation setup protocol (RSVP) message generator for transmitting a RSVP PATH message, the RSVP PATH message including a direction indication, the direction indicator indicating that reservations should be made for the user equipment to transmit only, to receive only or to both transmit and receive; and

an RSVP message receiver for receiving an RSVP RESV message indicating that reservations have been made as a result of the RSVP PATH message.

22. The user equipment of claim 21 wherein the RSVP message generator for producing a RSVP Confirm message indicating receipt of the RSVP RESV message.

23. The user equipment of claim 21 wherein the direction indication is a four bit value.

24. A wireless user equipment for use in initiating a packet based session, the user equipment comprising:

means for sending a RSVP PATH message, the RSVP PATH message including a direction indicator, the direction indicator indicating that reservations should be made for the user equipment to transmit only, to receive only or to both transmit and receive; and

means for receiving an RSVP RESV message indicating that reservations have been made as a result of the RSVP PATH message.

25. The user equipment of claim 24 wherein the means for sending the RSVP PATH message produces a RSVP Confirm message indicating receipt of the RSVP RESV message.

26. The user equipment of claim 25 wherein the direction indicator is a four bit value.

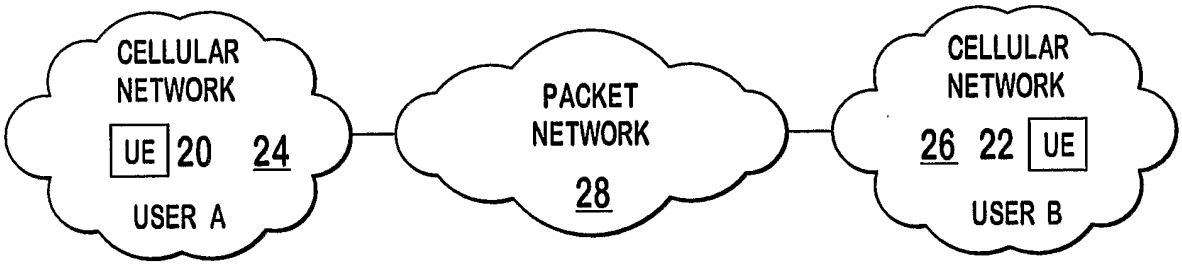
CELLULAR NETWORK
UE 20 24
USER A
PACKET NETWORK
28
CELLULAR NETWORK
26 22 UE
USER B

FIG. 1

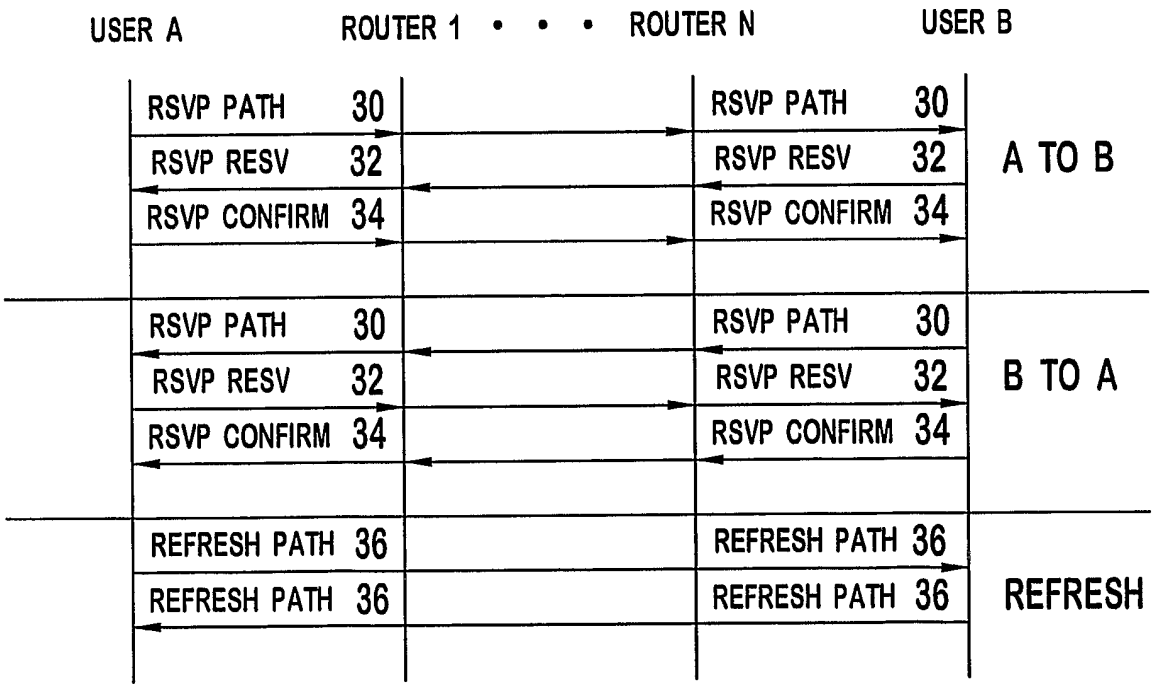
USER A
ROUTER 1 • • • ROUTER N
USER B
RSVP PATH 30
RSVP RESV 32
RSVP CONFIRM 34
A TO B
RSVP PATH 30
RSVP RESV 32
RSVP CONFIRM 34
B TO A
REFRESH PATH 36
REFRESH PATH 36
REFRESH

FIG. 2

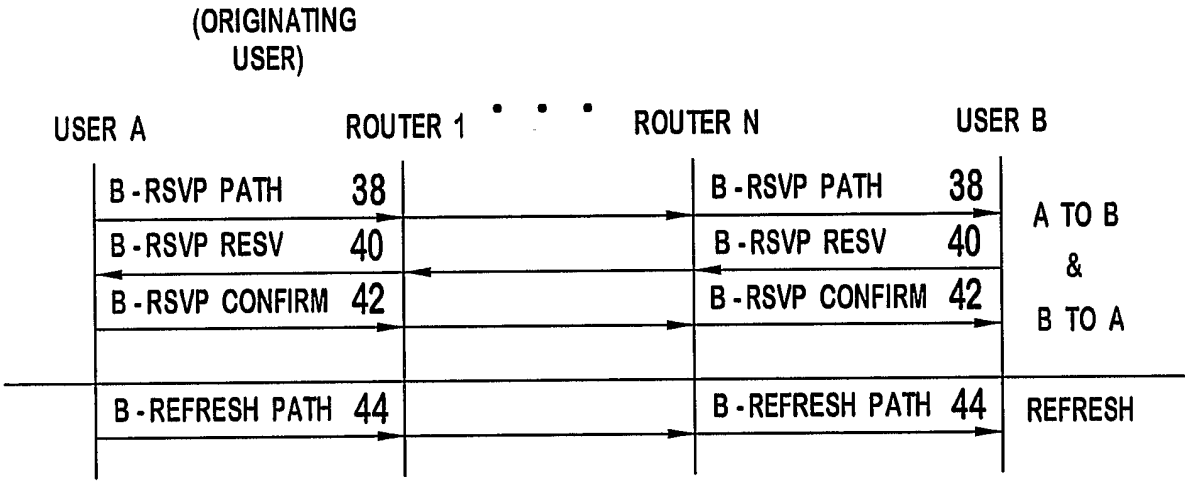

FIG. 3

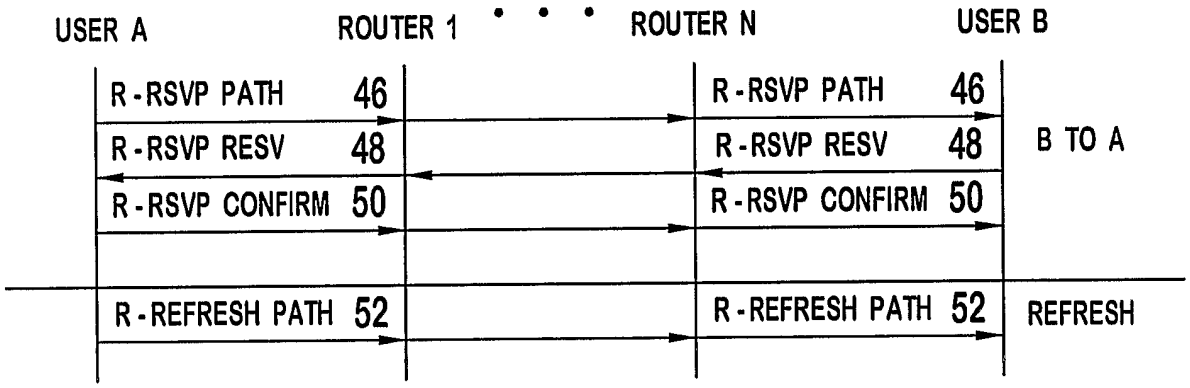

FIG. 4

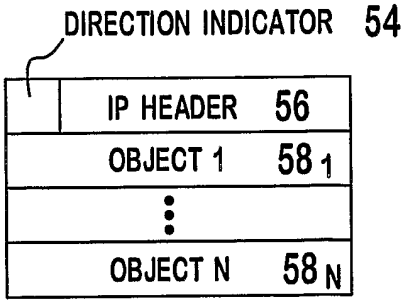

FIG. 5

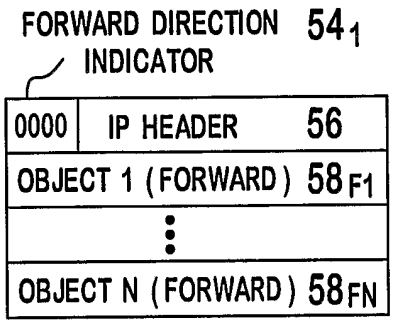

FIG. 6

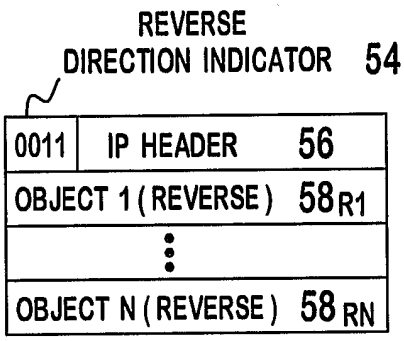

FIG. 7

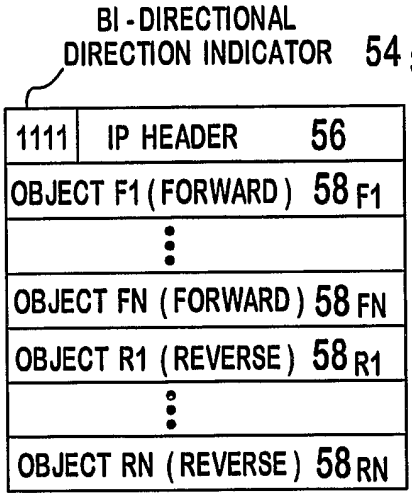

FIG. 8

```
<PATH MESSAGE> :: = <COMMON HEADER> [ <INTEGRITY> ]
                                    <SESSION> <RSVP_HOP>
                                        <TIME_VALUES>
                                        [ <POLICY_DATA> ... ]
                                        [ <SENDER DESCRIPTOR> ]
<SENDER DESCRIPTOR> : : = <SENDER_TEMPLATE> < SENDER_TSPEC >
                                        [ <ADSPEC> ]
```

FIG. 9

31 24	23 16	15 8	7 0
1 (a)	RESERVED		7 (b)
1 (c)	0	RESERVED	6 (d)
127 (e)	0 (f)		5 (g)
TOKEN BUCKET RATE [r] (FORWARD)			
TOKEN BUCKET SIZE [b] (FORWARD)			
PEAK DATA RATE [p] (FORWARD)			
MINIMUM POLICED UNIT [m] (FORWARD)			
MAXIMUM PACKET SIZE [M] (FORWARD)			
TOKEN BUCKET RATE [r] (REVERSE)			
TOKEN BUCKET SIZE [b] (REVERSE)			
PEAK DATA RATE [p] (REVERSE)			
MINIMUM POLICED UNIT [m] (REVERSE)			
MAXIMUM PACKET SIZE [M] (REVERSE)			

FIG. 10

31 24	23 16	15 8	7 0
1(c)	X	RESERVED	8(d)
4(e)	(f)		1(g)
IS HOP CNT (32-BIT UNSIGNED INTEGER)			
6(h)	(i)		1(j)
PATH b/w ESTIMATE (FORWARD)			
PATH b/w ESTIMATE (REVERSE)			
8(k)	(l)		1(m)
MINIMUM PATH LATENCY (FORWARD)			
MINIMUM PATH LATENCY (REVERSE)			
10(n)	(o)		1(p)
COMPOSED MTU (FORWARD)			
COMPOSED MTU (REVERSE)			

FIG. 11

31 24	23 16	15 8	7 0
2(c)	X	RESERVED	8(d)
4(e)	(f)		1(g)
END-TO-END COMPOSED VALUE FOR C[Ctot] (FORWARD)			
END-TO-END COMPOSED VALUE FOR C[Ctot] (REVERSE)			
134(f)	(g)		1(h)
END-TO-END COMPOSED VALUE FOR D[Dtot] (FORWARD)			
END-TO-END COMPOSED VALUE FOR D[Dtot] (REVERSE)			
135(i)	(j)		1(k)
SINCE-LAST-RESHAPING POINT COMPOSED C[Csum] (FORWARD)			
SINCE-LAST-RESHAPING POINT COMPOSED C[Csum] (REVERSE)			
136(l)	(m)		1(n)
SINCE-LAST-RESHAPING POINT COMPOSED D[Dsum] (FORWARD)			
SINCE-LAST-RESHAPING POINT COMPOSED D[Dsum] (REVERSE)			
SERVICE-SPECIFIC GENERAL PARAMETER/VALUE IF PRESENT			

FIG. 12

```
<RESV MESSAGE> :: = <COMMON HEADER> [ <INTEGRITY> ]
                              <SESSION>  <RSVP_HOP>
                                        <TIME_VALUES>
                                        [ <RESV_CONFIRM> ] [ <SCOPE> ]
                                        [ <POLICY_DATA> ... ]
                                        <STYLE> <FLOW DESCRIPTOR LIST>
          <FLOW DESCRIPTOR LIST> : : =  <EMPTY>
                                  <FLOW DESCRIPTOR LIST> <FLOW DESCRIPTOR>
```

FIG. 13

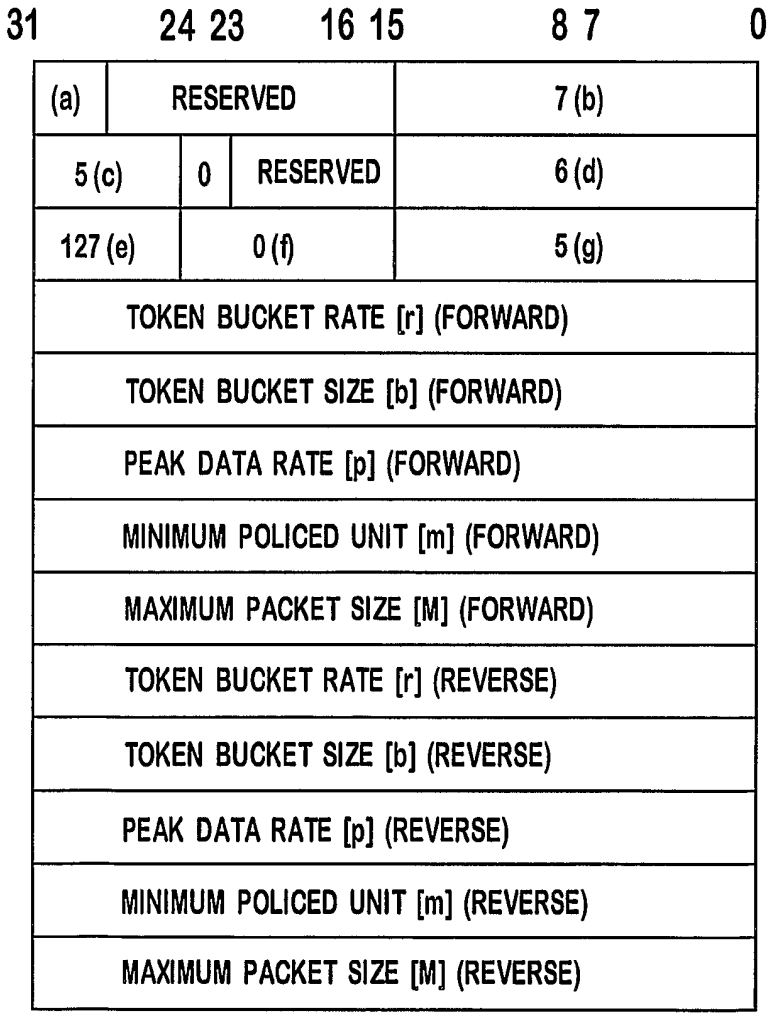

FIG. 14

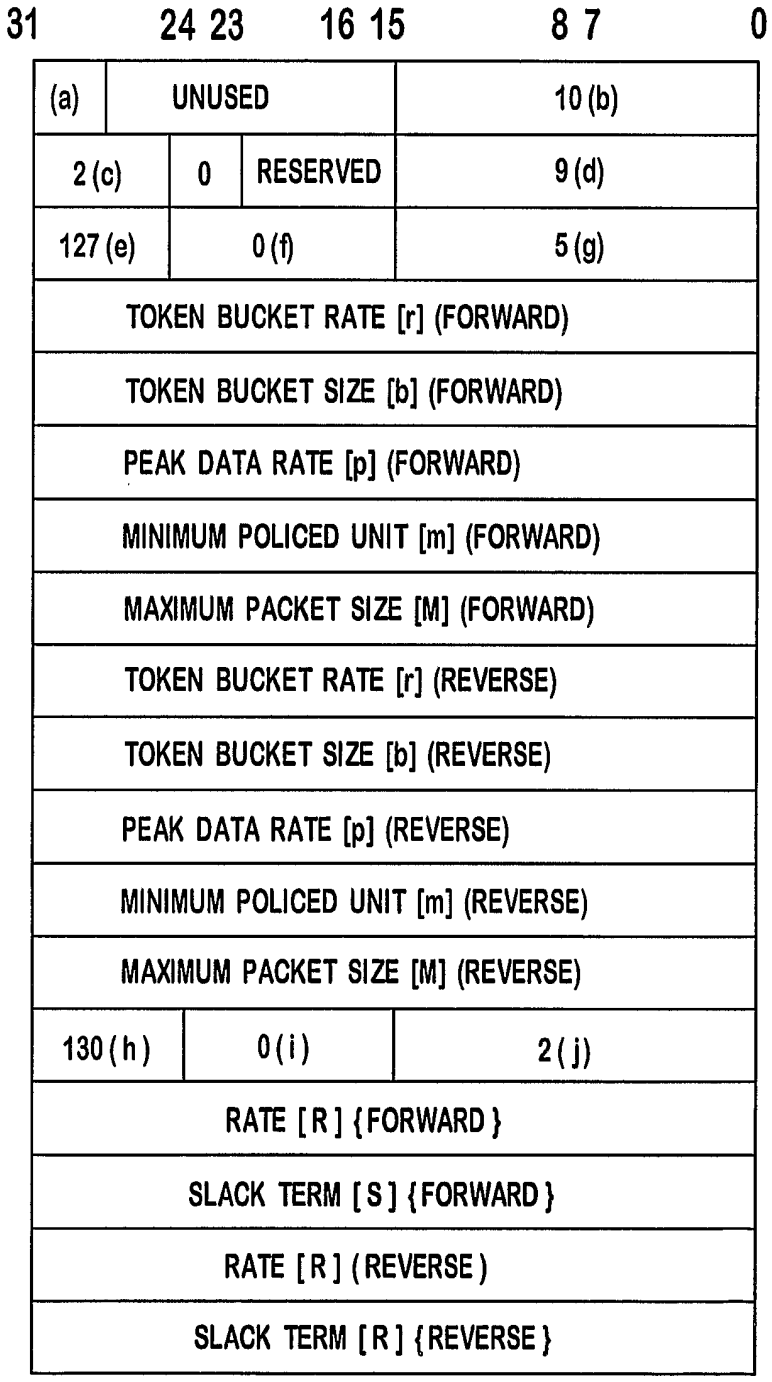
31 24 23 16 15 8 7 0
(a)
UNUSED
10 (b)
2 (c)
0
RESERVED
9 (d)
127 (e)
0 (f)
5 (g)
TOKEN BUCKET RATE [r] (FORWARD)
TOKEN BUCKET SIZE [b] (FORWARD)
PEAK DATA RATE [p] (FORWARD)
MINIMUM POLICED UNIT [m] (FORWARD)
MAXIMUM PACKET SIZE [M] (FORWARD)
TOKEN BUCKET RATE [r] (REVERSE)
TOKEN BUCKET SIZE [b] (REVERSE)
PEAK DATA RATE [p] (REVERSE)
MINIMUM POLICED UNIT [m] (REVERSE)
MAXIMUM PACKET SIZE [M] (REVERSE)
130 (h)
0 (i)
2 (j)
RATE [R] {FORWARD}
SLACK TERM [S] {FORWARD}
RATE [R] (REVERSE)
SLACK TERM [R] {REVERSE}

FIG. 15

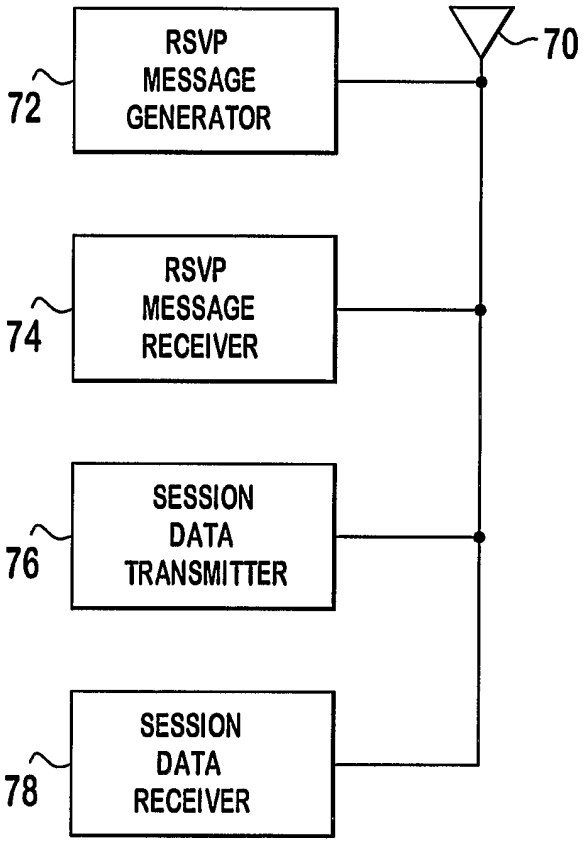
RSVP
MESSAGE
GENERATOR
72
70
RSVP
MESSAGE
RECEIVER
74
SESSION
DATA
TRANSMITTER
76
SESSION
DATA
RECEIVER
78

FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/35186

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04Q 7/24, 7/28; H04L 12/66

US CL : 370/328, 338, 345, 347, 348, 352, 465, 467, 469

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)

U.S. : 370/328, 338, 345, 347, 348, 352, 465, 467, 469

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim
X	TALUKDAR ET AL, MRSVP: A Resource Reservation Protocol for an Integrated Services Network with Mobile Hosts, http://citeseer.nj.nec.com/181006.htm, pages 1-25, 1997.	1-26
X,P	US 2002/0015395 A1 (KARAGIANNIS) 07 FEBRUARY 2002, entire document.	1-26
A,P	US 6,385,195 B2 (SICHER ET AL) 07 MAY 2002, see Fig. 4 and col. 7, line 47 to col. 8, line 26.	1-26

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

*	Special categories of cited documents:	"T"	later document published after the international filing date or priorit date and not in conflict with the application but cited to understan the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot b considered novel or cannot be considered to involve an inventive ste when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot b considered to involve an inventive step when the document is combine with one or more other such documents, such combination being obvious to a person skilled in the art
"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)		
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search 31 DECEMBER 2002	Date of mailing of the international search report 04 FEB 2003
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer DUONG, FRANK Telephone No. (703) 308-5423

Form PCT/ISA/210 (second sheet) (July 1998)★