

Juniper Networks, Inc.
v.
Monarch Networking Solutions, Inc.

Monarch's Trial Presentation

IPR2024-00175
US Patent No. 8,693,369

Judges Thu A. Dang, Charles J. Boudreau, and Norman H. Beamer

The '369 Patent

Key Points

- Grounds 2 & 4, Claims 1, 5, and 6
 - Fangman does not disclose routing a packet based on port ranges
- Grounds 3 & 5, Claims 1, 5, and 6
 - King does not disclose routing a packet based on port ranges
- All Grounds, All Claims
 - A POSITA would not modify any of the art to use port masks as claimed
- Ground 1, Claims 8 & 12
 - Biswas does not disclose a routing identifier

'369 Patent: Using Port Masks to Manage IP address availability

(12) United States Patent Boucadair

(10) Patent No.: **US 8,693,369 B2**
(45) Date of Patent: **Apr. 8, 2014**

(54) METHOD OF ROUTING A DATA PACKET IN A NETWORK AND AN ASSOCIATED DEVICE

(75) Inventor: **Mohamed Boucadair**, Rennes (FR)
(73) Assignee: **Orange**, Paris (FR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 385 days.

(21) Appl. No.: **12/935,040**

(22) PCT Filed: **Mar. 31, 2009**

(86) PCT No.: **PCT/FR2009/050548**

§ 371 (c)(1),
(2), (4) Date: **Sep. 28, 2010**

(87) PCT Pub. No.: **WO2009/125158**

PCT Pub. Date: **Oct. 15, 2009**

(65) Prior Publication Data

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(30) Foreign Application Priority Data

Mar. 31, 2008 (FR) 08 52108

(51) Int. Cl.

H04L 12/28 (2006.01)

(52) U.S. Cl.

USPC 370/254; 370/351

(58) Field of Classification Search

USPC 370/254, 351

See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

7,320,027 B1 1/2008 Chang et al.
7,751,339 B2 * 7/2010 Melton et al. 370/252
7,894,451 B2 * 2/2011 Parker et al. 370/395.32
7,986,670 B2 * 7/2011 Halbur et al. 370/331
2002/0116523 A1 8/2002 Warner et al.
2002/0141389 A1 10/2002 Fangman et al. 370/353
2003/0053448 A1 * 3/2003 Craig et al. 709/238
2003/0088694 A1 * 5/2003 Patek et al. 709/238
2009/0279548 A1 * 11/2009 Davis et al. 370/394
2011/0067119 A1 * 3/2011 Baum 726/34

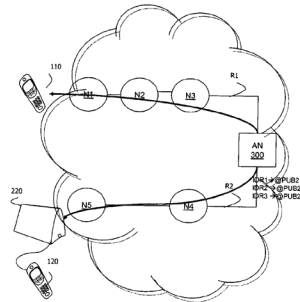
* cited by examiner

Primary Examiner — Hassan Kizou
Assistant Examiner — Deepa Behur
(74) Attorney, Agent, or Firm — Drinker Biddle & Reath LLP

(57) ABSTRACT

A method of routing a data packet in a telecommunications network, said packet comprising a primary destination address and a destination port number. On reception of said packet, the following steps are executed: determining a port mask defining a range of port numbers to which the destination port number belongs; selecting an identifier of a destination piece of equipment from a plurality of equipment identifiers associated with said destination address on the basis of the port mask; and routing the packet to the destination piece of equipment on the basis of said identifier.

17 Claims, 9 Drawing Sheets



EX1001 Fig. 3

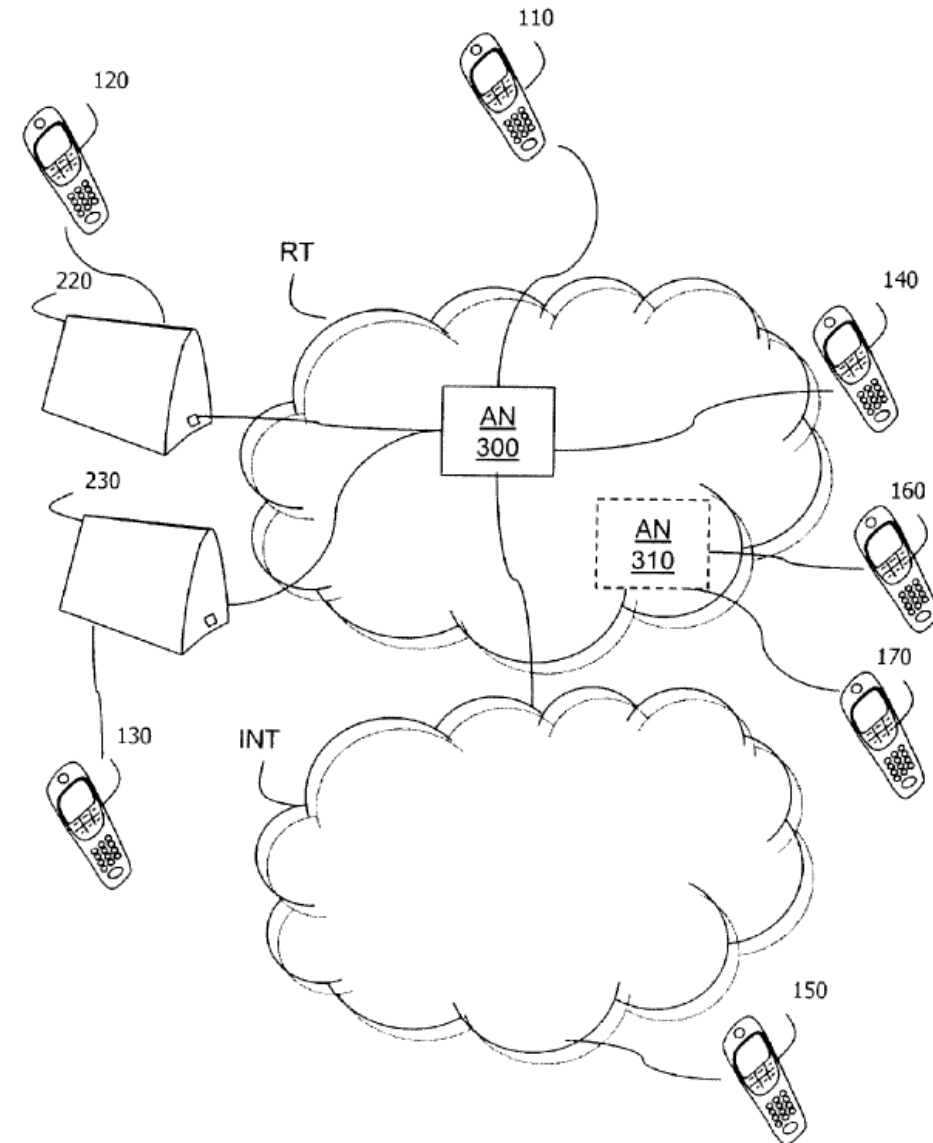
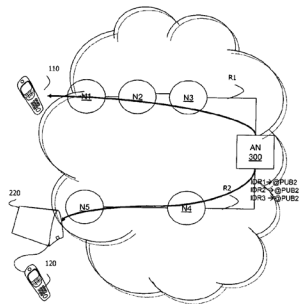
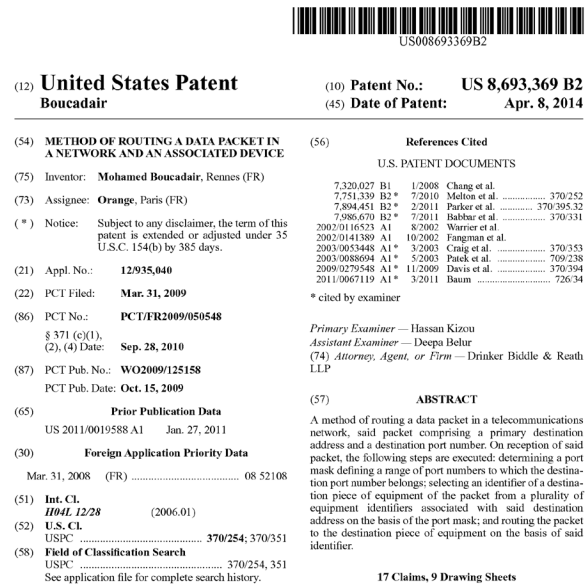


FIG. 3

'369 Patent: Using Port Masks to Manage IP address availability

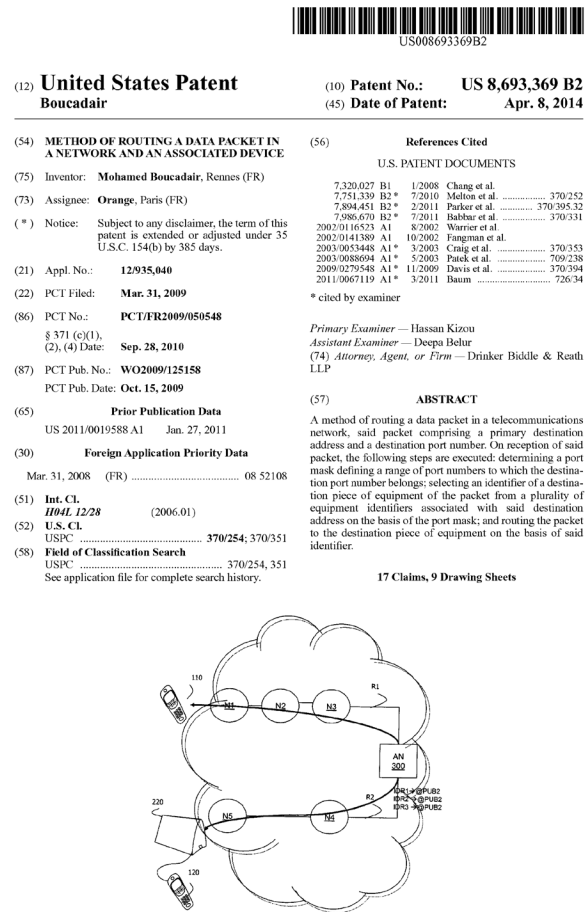


EX1001 at 1:53-2:4

It is commonly accepted in the IP service provider community that exhaustion of public IPv4 addresses is inevitable. To avoid this problem, the community has already taken action to define a new protocol, Internet Protocol version 6 (IPv6), which offers a large number of IP addresses and a hierarchical routing mechanism offering improved performance. However, that Solution is not in practice activated by operators for financial or strategic reasons. The same providers are nevertheless not indifferent to recent warnings emanating from the Internet Engineering Task Force (IETF), especially in reports presented within the Global Routing Operations Working Group (GROW) concerning the risk of exhaustion of IANA IPv4 addresses by the end of 2009.

To limit the number of IPv4 public addresses necessary to provide an IP connectivity service, a dual NAT or Operator NAT solution has been proposed and implemented. It activates a NAT function in the telecommunications network of the operator So that the home gateways use private addressing in their NAT tables.

'369 Patent: Using Port Masks to Manage IP address availability



The invention consists in reducing the range of port numbers available to terminal equipment for each application by assigning a piece of terminal equipment a port mask that defines a sub-portion of this range. The port mask assigned in this way to a particular piece of terminal equipment is used in combination with its primary IP address to route data packets that are sent to it without degrading IP service.

It should be noted that an IP connectivity service provider must comply with the constraint that two pieces of terminal equipment having the same primary address must necessarily receive different port masks.

'369 Patent: Exemplary Port Masks

MC

1	1	1	x	x	x	x	x	x	x	x	x	x	x	x	x
1	1	1	1	x	x	x	x	x	x	x	x	x	x	x	x
1	1	1	1	1	1	1	1	1	1	1	1	x	x	x	x
1	1	1	1	1	1	1	1	1	1	x	x	x	x	x	x
1	1	1	1	1	1	1	1	1	1	1	x	x	x	x	x
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	x
x	x	x	x	1	1	1	1	1	1	1	1	1	1	1	1
x	x	x	x	x	1	1	1	1	1	1	1	1	1	1	1

FIG. 2A

MC

1	1	1	x	x	x	x	x	1	x	x	x	x	x	x	x
1	1	1	1	x	x	x	x	1	1	x	x	x	x	x	x
1	1	1	1	x	x	1	1	1	1	1	1	x	x	x	x
1	1	1	1	1	x	x	1	1	1	x	x	x	x	x	x
1	1	1	1	1	1	1	1	1	1	1	x	x	1	x	x
1	1	1	1	x	x	x	1	x	1	x	1	1	1	1	x
x	x	x	x	1	x	1	x	1	x	1	x	1	x	1	1
x	x	x	x	x	1	1	x	1	x	1	1	1	x	x	x

FIG. 2B

EX1001

Port Masks Can Define Port Ranges

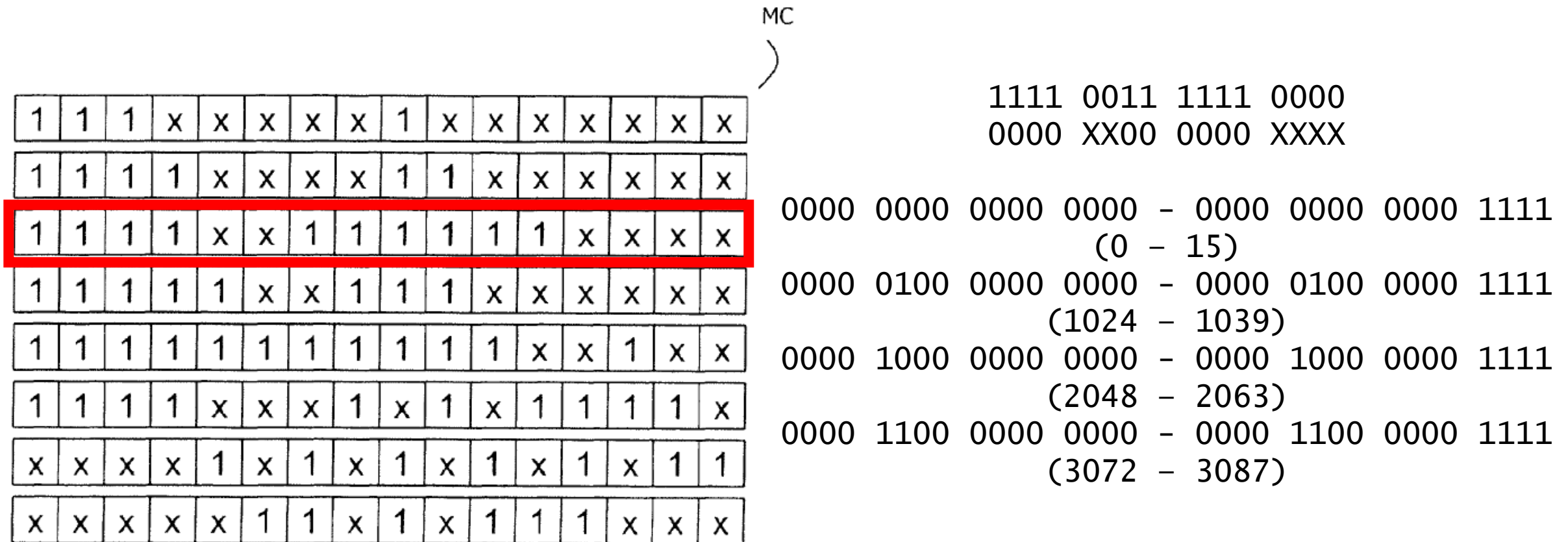


FIG. 2B

EX1001

Port Masks Can Define Port Ranges

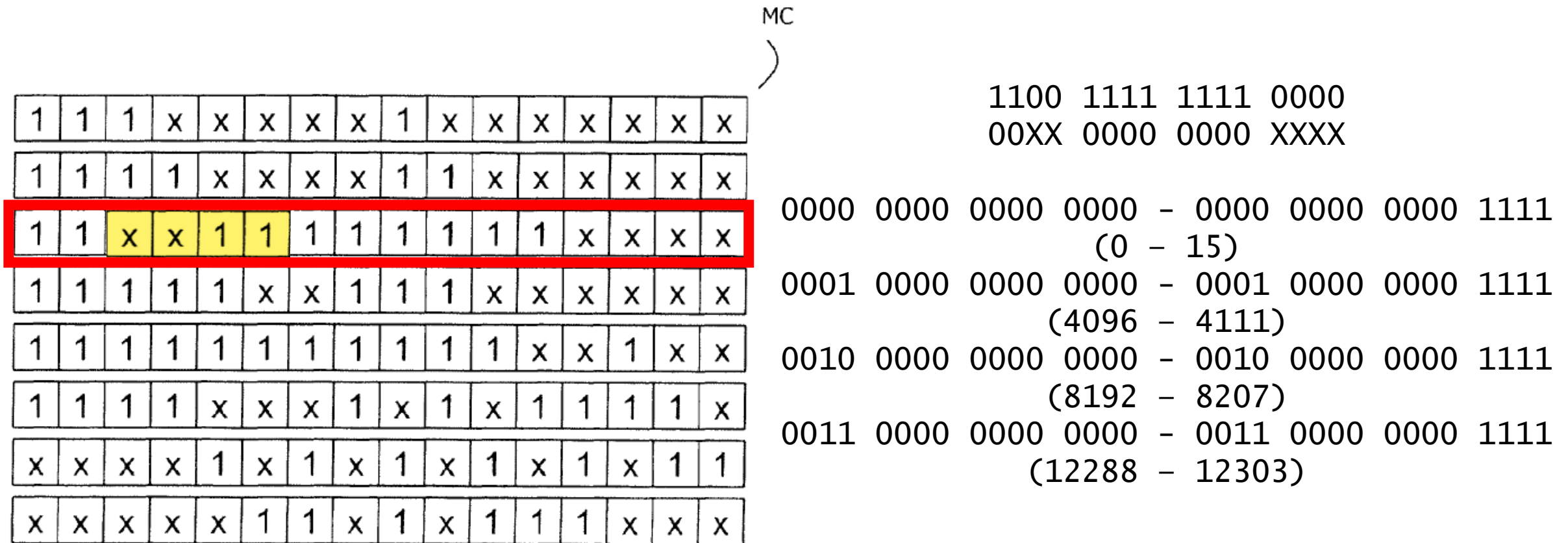


FIG. 2B

EX1001

Port Masks Can Define Port Ranges

1111 0011 1111 0000
0000 XX00 0000 XXXX

0000 0000 0000 0000 - 0000 0000 0000 1111
(0 - 15)
0000 0100 0000 0000 - 0000 0100 0000 1111
(1024 - 1039)
0000 1000 0000 0000 - 0000 1000 0000 1111
(2048 - 2063)
0000 1100 0000 0000 - 0000 1100 0000 1111
(3072 - 3087)

1100 1111 1111 0000
00XX 0000 0000 XXXX

0000 0000 0000 0000 - 0000 0000 0000 1111
(0 - 15)
0001 0000 0000 0000 - 0001 0000 0000 1111
(4096 - 4111)
0010 0000 0000 0000 - 0010 0000 0000 1111
(8192 - 8207)
0011 0000 0000 0000 - 0011 0000 0000 1111
(12288 - 12303)

Three distinct port ranges

Certain Port Numbers Are Typically Not Available To Terminals

Network Working Group
Request for Comments: 2663
Category: Informational

P. Srisuresh
M. Holdrege
Lucent Technologies
August 1999

IP Network Address Translator (NAT) Terminology and Considerations

Status of this Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution and use of the memo is unlimited.

Copyright Notice

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Preface

The motivation behind this document is to provide clarity to the terms used in conjunction with Network Address Translators. "Network Address Translator" means different things in different contexts. The intent of this document is to define the various flavors of NAT and standardize the meaning of terms used.

The authors listed are editors for this document and owe thanks to contributions from members of the working group. Large parts of the document titled, "IP Network Address Translator (NAT)" were extracted almost as is, to form the initial basis for this document. The editors would like to thank the authors Pyda Srisuresh and Egevang for the same. The editors would like to thank Pravar Akkiraju for his contributions in describing NAT deployment scenarios. The editors would also like to thank the IESG members Scott Bradner, Vern Paxson and Thomas Narten for their detailed review of the document and adding clarity to the text.

Abstract

Network Address Translation is a method by which IP addresses are mapped from one realm to another, in an attempt to provide transparent routing to hosts. Traditionally, NAT devices are used to connect an isolated address realm with private unregistered addresses to an external realm with globally unique registered addresses. This document attempts to describe the operation of NAT devices, associated considerations in general, and to define the terminology used to identify various flavors of NAT.

2.4. TU ports, Server ports, Client ports

For the remainder of this document, we will refer TCP/UDP ports associated with an IP address simply as "TU ports".

For most TCP/IP hosts, TU port range 0-1023 is used by servers listening for incoming connections. Clients trying to initiate a connection typically select a source TU port in the range of 1024-65535. However, this convention is not universal and not always followed. Some client stations initiate connections using a source TU port number in the range of 0-1023, and there are servers listening on TU port numbers in the range of 1024-65535.

A list of assigned TU port services may be found in RFC 1700 [Ref 2].

Port Masks Cannot Define Arbitrary Ranges



US008032639B2

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

(10) **Patent No.:** US
(45) **Date of Patent:**

(54) **APPARATUS AND METHOD FOR PROVIDING DATA SESSION SOURCE DEVICE INFORMATION**

(75) Inventors: **Matthew Lawrence King**, Hampshire (GB); **Frank Brockners**, Köln (DE); **Richard Mandred Pruss**, Queensland (AU); **Wayne Roiger**, Golden Valley, MN (US)

(73) Assignee: **Cisco Technology, Inc.**, San Jose, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1045 days.

(21) Appl. No.: **11/439,930**

(22) Filed: **May 23, 2006**

(65) **Prior Publication Data**
US 2007/0276957 A1 Nov. 29, 2007

(51) **Int. Cl.**
G06F 15/16 (2006.01)
G06F 15/173 (2006.01)
H04L 12/28 (2006.01)

(52) **U.S. Cl.** **709/227; 709/238; 370/351**

(58) **Field of Classification Search** **709/227, 709/238; 370/351**
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS
6,563,824 B1 * 5/2003 Bhatia et al.
7,003,574 B1 * 2/2006 Bahl et al.
2002/0049840 A1 * 4/2002 Squire et al.
2003/0007486 A1 * 1/2003 March et al.
2003/0084162 A1 * 5/2003 Johnson et al.
2003/0106067 A1 * 6/2003 Hoskins et al.
2003/0108052 A1 * 6/2003 Inoue et al.
2006/0062203 A1 * 3/2006 Satapati et al.
OTHER PUBLICATIONS
Information Sciences Institute, University of California, "Transmission Control Protocol DARPA Internet Specification," (IETF RFC 793), Sep. 1981, * cited by examiner
Primary Examiner — Ranodhi Serrao
(74) *Attorney, Agent, or Firm* — Hickman & Becker LLP

(57) **ABSTRACT**
A community translation service device is arranged to receive data traffic from a community. The traffic includes a native identifier and, as a source identifier, a source community translation service device component and a database for storing a session identifiers associated with the translation component is arranged to translate the session identifier to an assigned data session identifier with the source device, the community device further being arranged to forward the assigned data session identifier including the assigned data session identifier source device information to a service device.

19 Claims, 6 Drawing Sheets

SOURCE ADDRESS	TCP PORT	USER DEVICE
IPCPE	1024-1039	IP1'
IPCPE	1040-1055	1P2'

FIG. 7

Cannot exclude lower numbers with simple AND function

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT	OUTPUT SOURCE ADDRESS
400	402	404	406	408
100-102	1024	IP1	1101	IPCPE
118-102	1024	IP2	1034	IPCPE
100-116	1025	IP1	1042	IPCPE
118-116	1025	IP2	1106	IPCPE

EX1025 Fig. 7

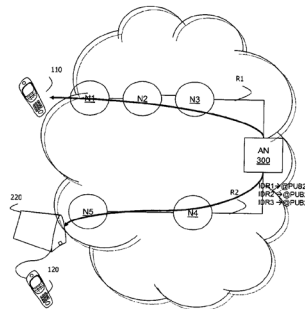
The '369 Patent

Key Points

- **Grounds 2 & 4, Claims 1, 5, and 6**
 - **Fangman does not disclose routing a packet based on port ranges**
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 - Biswas does not disclose a routing identifier

'369 Claims 1, 5, and 6: Port Mask Defines Range of Ports

 US008693369B2	
(12) United States Patent Boucadair	(10) Patent No.: US 8,693,369 B2 (45) Date of Patent: Apr. 8, 2014
(54) METHOD OF ROUTING A DATA PACKET IN A NETWORK AND AN ASSOCIATED DEVICE	(56) References Cited U.S. PATENT DOCUMENTS
(75) Inventor: Mohamed Boucadair , Rennes (FR)	7,320,027 B1 1/2008 Chang et al.
(73) Assignee: Orange , Paris (FR)	7,751,539 B2* 7/2010 Melton et al. 370/252
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 385 days.	7,894,451 B2* 2/2011 Parker et al. 370/395.32
	7,986,670 B2* 7/2011 Babbar et al. 370/331
	2002/0116523 A1 8/2002 Warrior et al.
	2002/0141389 A1 10/2002 Fangman et al.
	2003/0053448 A1* 3/2003 Craig et al. 370/353
	2003/0086904 A1* 5/2003 Pasik et al. 709/238
	2009/0279548 A1* 11/2009 Davis et al. 370/394
	2011/0067119 A1* 3/2011 Baum 726/34
(21) Appl. No.: 12/935,040	* cited by examiner
(22) PCT Filed: Mar. 31, 2009	
(86) PCT No.: PCT/FR2009/050548	
§ 371 (c)(1), (2), (4) Date: Sep. 28, 2010	<i>Primary Examiner</i> — Hassan Kizou <i>Assistant Examiner</i> — Deepa Bolur (74) <i>Attorney, Agent, or Firm</i> — Drinker Biddle & Reath LLP
(87) PCT Pub. No.: WO2009/125158 PCT Pub. Date: Oct. 15, 2009	(57) ABSTRACT
(65) Prior Publication Data US 2011/0019588 A1 Jun. 27, 2011	A method of routing a data packet in a telecommunications network, said packet comprising a primary destination address and a destination port number. On reception of said packet, the following steps are executed: determining a port mask defining a range of port numbers to which the destination port number belongs; selecting an identifier of a destination piece of equipment of the packet from a plurality of equipment identifiers associated with said destination address on the basis of the port mask; and routing the packet to the destination piece of equipment on the basis of said identifier.
(30) Foreign Application Priority Data Mar. 31, 2008 (FR) 08 521 008	
(51) Int. Cl. H04L 12/28 (2006.01)	
(52) U.S. Cl. USPC 370/254; 370/351	
(58) Field of Classification Search USPC 370/254, 351 See application file for complete search history.	



EX1001 Claim 1

1. A method of routing an IP data packet in a telecommunications network to a destination equipment, said packet comprising a primary destination address and a destination port number, said method comprising, on reception of said packet, the following steps:

determining a port mask assigned to the destination equipment, the port mask defining a range of port numbers to which the destination port number belongs;

selecting at least one identifier of the destination equipment of the packet from a plurality of equipment identifiers associated with said primary destination address based on the port mask; and

routing the packet to the destination equipment based on said identifier.

'369 Claims 1, 5, and 6: Port Mask Defines Range of Ports

5. A device for routing an IP data packet in a telecommunications network to a destination equipment, said packet comprising a primary destination address and a destination port number, wherein said device comprises, on reception of said packet:

- a processor that determines a port mask assigned to the destination equipment, the port mask defining a range of port numbers to which the destination port number belongs;

- the processor selects an identifier of the destination equipment of the packet from a plurality of equipment identifiers associated with said primary destination address based on the port mask; and

- a communication unit that routes the packet to the destination equipment based on said identifier.

6. Telecommunications network equipment adapted to receive an IP data packet comprising a primary destination address and a destination port number, comprising at least one routing device comprising:

- a processor that determines a port mask assigned to a destination equipment, the port mask defining a range of port numbers to which the destination port number belongs;

- the processor selects an identifier of the destination equipment of the packet from a plurality of equipment identifiers associated with said primary destination address based on the port mask; and

- a communication unit that routes the packet to the destination equipment based on said identifier.

'369 Claims 1, 5, and 6: Port Mask Defines Range of Ports

1. A method of routing an IP data packet in a telecommunications network to a destination equipment, said packet comprising a primary destination address and a destination port number, said method comprising, on reception of said packet, the following steps:

determining a port mask assigned to the destination equipment, the port mask defining a range of port numbers to which the destination port number belongs;

selecting at least one identifier of the destination equipment of the packet from a plurality of equipment identifiers associated with said primary destination address based on the port mask; and

routing the packet to the destination equipment based on said identifier.

5. A device for routing an IP data packet in a telecommunications network to a destination equipment, said packet comprising a primary destination address and a destination port number, wherein said device comprises, on reception of said packet:

a processor that determines a port mask assigned to the destination equipment, the port mask defining a range of port numbers to which the destination port number belongs;

the processor selects an identifier of the destination equipment of the packet from a plurality of equipment identifiers associated with said primary destination address based on the port mask; and

a communication unit that routes the packet to the destination equipment based on said identifier.

6. Telecommunications network equipment adapted to receive an IP data packet comprising a primary destination address and a destination port number, comprising at least one routing device comprising:

a processor that determines a port mask assigned to a destination equipment, the port mask defining a range of port numbers to which the destination port number belongs;

the processor selects an identifier of the destination equipment of the packet from a plurality of equipment identifiers associated with said primary destination address based on the port mask; and

a communication unit that routes the packet to the destination equipment based on said identifier.

To transmit a packet to its destination:

- Determine a port mask assigned to the destination device
- The port mask defines a range of port numbers assigned to the destination device
- Select and identifier based on the port mask

Fangman: IP Telephone System



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

(10) Patent No.: US 7,068,647 E
(45) Date of Patent: *Jun. 27, 2004

(54) SYSTEM AND METHOD FOR ROUTING IP PACKETS

(75) Inventors: **Richard E. Fangman**, Pflugerville, TX (US); **Jason D. Preston**, Austin, TX (US)

(73) Assignee: **Voxpath Networks, Inc.**, Austin, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 868 days.

(21) Appl. No.: 09/903,836

(22) Filed: **Jul. 11, 2001**

(65) **Prior Publication Data**
US 2002/0141389 A1 Oct. 3, 2002

Related U.S. Application Data

(51) **Int. Cl.**
H04L 12/66 (2006.01)

(52) U.S. CL 370/352; 370/389; 370/465;
370/401

(58) Field of Classification Search 370/352,
370/353, 354, 355, 401, 466, 475, 389

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,790,548 A *	8/1998	Sistanizadeh et al.	370/401
6,061,349 A *	5/2000	Coile et al.	370/389

(10) Patent No.: US 7,068,647 E
(45) Date of Patent: *Jun. 27, 2004

6,073,178	A *	6/2000	Wong et al.	709
6,178,455	B1 *	1/2001	Schutte et al.	709
6,286,038	B1 *	9/2001	Reichmeyer et al.	709
6,533,660	B1 *	3/2002	Burger et al.	379-88
6,381,638	B1 *	4/2002	Mahler et al.	709
6,385,635	B1 *	5/2002	Stitarman et al.	709
6,496,867	B1 *	12/2002	Beser et al.	709
6,515,997	B1	2/2003	Feltner et al.	709
6,523,068	B1 *	2/2003	Beser et al.	709
6,577,642	B1 *	6/2003	Fijolek et al.	370

(Continued)

OTHER PUBLICATIONS

Written Opinion, Application No. PCT/US02/10544, mailed Feb. 26, 2004.

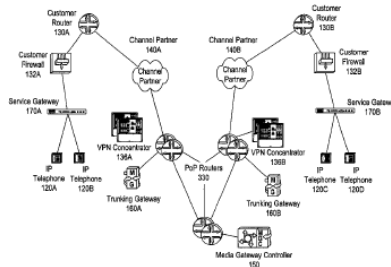
(Continued)

Primary Examiner—Ajit Patel
Assistant Examiner—Andrew C. Lee
(74) Attorney, Agent, or Firm—Meyertons Hood Kis

(57) **ABSTRACT**

System and method for routing packets for IP telephony. The system includes an IP telephone (IPT) and a Service Gateway (SG) coupled via a network. The SG receives a packet from the IPT, including a private source IP address (SIPA), source port number (SPN), and destination information for an IP device, performs network address translation (NAPT) on the data packet, and sends the IP device. The NAPT changes the private SIA to a public SIA, leaving the SPN unchanged. The SG receives a packet from the IP device, including a public destination address (DIPA, i.e., said public SIA), a destination port number (DPN, i.e., said SPN), and source information. The SG performs NAPT on the data packet, using the public DIPA and the DPN to identify the IPT, changing the public DIPA to the private SIPA, leaving the DPN unchanged, and sends the data packet to the IPT.

43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024

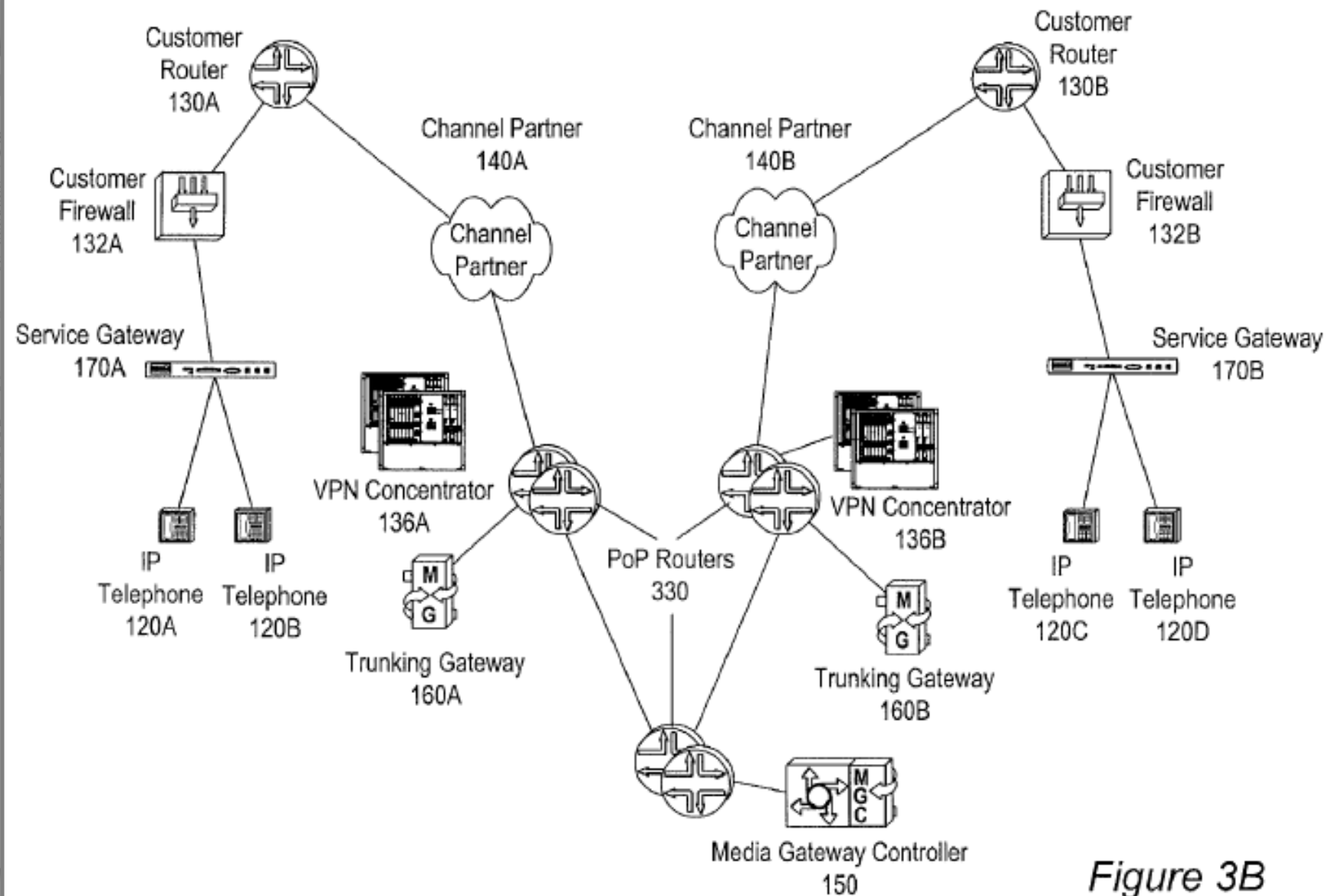


Figure 3B

Fangman: IP Telephone System

(12) United States Patent Fangman et al.

(10) Patent No.: US 7,068,647 B2
(45) Date of Patent: *Jun. 27, 2006

(54) SYSTEM AND METHOD FOR ROUTING IP PACKETS

(75) Inventors: Richard E. Fangman, Pflugerville, TX (US); Jason D. Preston, Austin, TX (US)

(73) Assignee: Voxpath Networks, Inc., Austin, TX (US)

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This patent is subject to a terminal disclaimer.

(21) Appl. No.: 09/903,836

(22) Filed: Jul. 11, 2001

(65) Prior Publication Data
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(60) Related U.S. Application Data
Provisional application No. 60/281,908, filed on Apr. 3, 2001.

(51) Int. Cl. H04L 12/66 (2006.01)

(52) U.S. Cl. 370/352; 370/389; 370/465; 370/401
(58) Field of Classification Search 370/352, 370/353, 354, 355, 401, 466, 475, 389
See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

5,790,548 A * 8/1998 Sistanizadeh et al. 370/401
6,061,349 A * 5/2000 Cole et al. 370/389

6,073,178 A * 6/2000 Wong et al. 709/229
6,178,455 B1 * 1/2001 Schutte et al. 709/228
6,286,038 B1 * 9/2001 Reichmeyer et al. 709/220
6,353,660 B1 * 3/2002 Burger et al. 379/88.17
6,381,638 B1 * 4/2002 Mahler et al. 709/220
6,385,653 B1 * 5/2002 Sittman et al. 709/230
6,496,867 B1 * 12/2002 Besser et al. 709/245
6,515,997 B1 2/2003 Feltner et al.
6,523,068 B1 * 2/2003 Besser et al. 709/238
6,577,642 B1 * 6/2003 Fijolek et al. 370/465

(Continued)

OTHER PUBLICATIONS

Written Opinion, Application No. PCT/US02/10544, mailed Feb. 26, 2004.

(Continued)

Primary Examiner—Ajit Patel

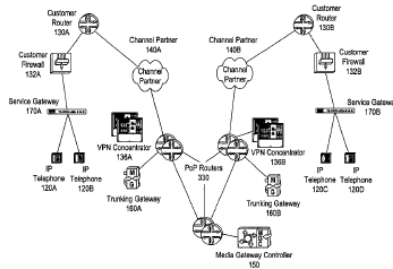
Assistant Examiner—Andrew C. Lee

(74) Attorney, Agent, or Firm—Meyertons Hood Kivlin Kowert & Goetzel, P.C.; Jeffrey C. Hood; Mark S. Williams

(57) ABSTRACT

System and method for routing packets for IP telephony. The system includes an IP telephone (IPT) and a Service Gateway (SG) coupled via a network. The SG receives a data packet from the IPT, including a private source IP address (SIPA), source port number (SPN), and destination information for an IP device, performs network address persistent port translation (NAPPT) on the data packet, and sends it to the IP device. NAPPT changes the private SIPA to a public SIPA, leaving the SPN unchanged. The SG receives a data packet from the IP device, including a public destination IP address (DIPA, i.e., said public SIPA), a destination port number (DPN, i.e., said SPN), and source information. NAPPTs the data packet, using the public DIPA and the DPN to identify the IPT, changing the public DIPA to the private SIPA, leaving the DPN unchanged, and sends the data packet to the IPT.

43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024, page

EX1024 Fig 4A

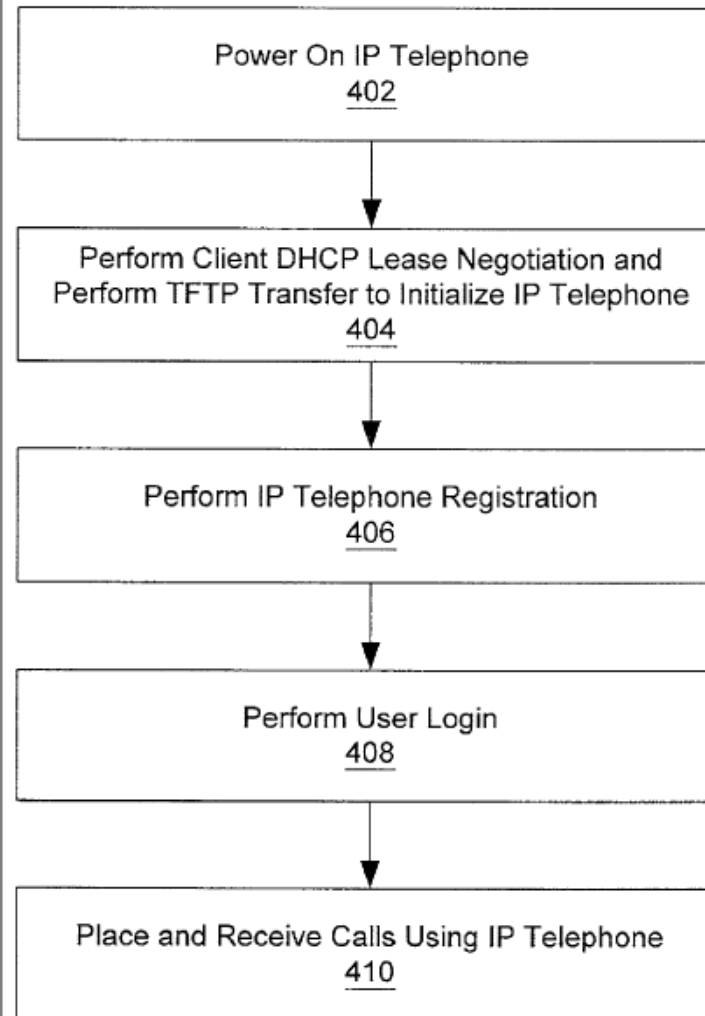


Figure 4A

Fangman: IP Telephone System

(12) United States Patent Fangman et al.

(10) Patent No.: US 7,068,647 B2
(45) Date of Patent: *Jun. 27, 2006

(54) SYSTEM AND METHOD FOR ROUTING IP PACKETS

(75) Inventors: Richard E. Fangman, Pflugerville, TX (US); Jason D. Preston, Austin, TX (US)

(73) Assignee: Voxpath Networks, Inc., Austin, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 868 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: 09/903,836

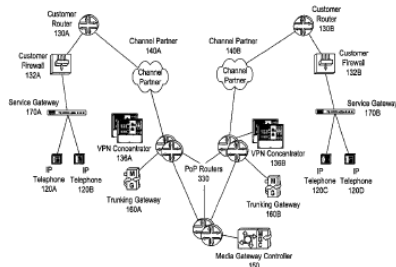
(22) Filed: Jul. 11, 2001

(65) Prior Publication Data
US 2002/0141389 A1 Oct. 3, 2002

(60) Related U.S. Application Data
Provisional application No. 60/281,908, filed on Apr. 3, 2001.

(51) Int. Cl. H04L 12/66 (2006.01)
(52) U.S. Cl. 370/352; 370/389; 370/465; 370/401
(58) Field of Classification Search 370/352, 370/353, 354, 355, 401, 466, 475, 389
See application file for complete search history.

(56) References Cited
U.S. PATENT DOCUMENTS
5,790,548 A * 8/1998 Sistanizadeh et al. 370/401
6,061,349 A * 5/2000 Cole et al. 370/389



Juniper Exhibit 1024, page

EX1024 Fig 4B

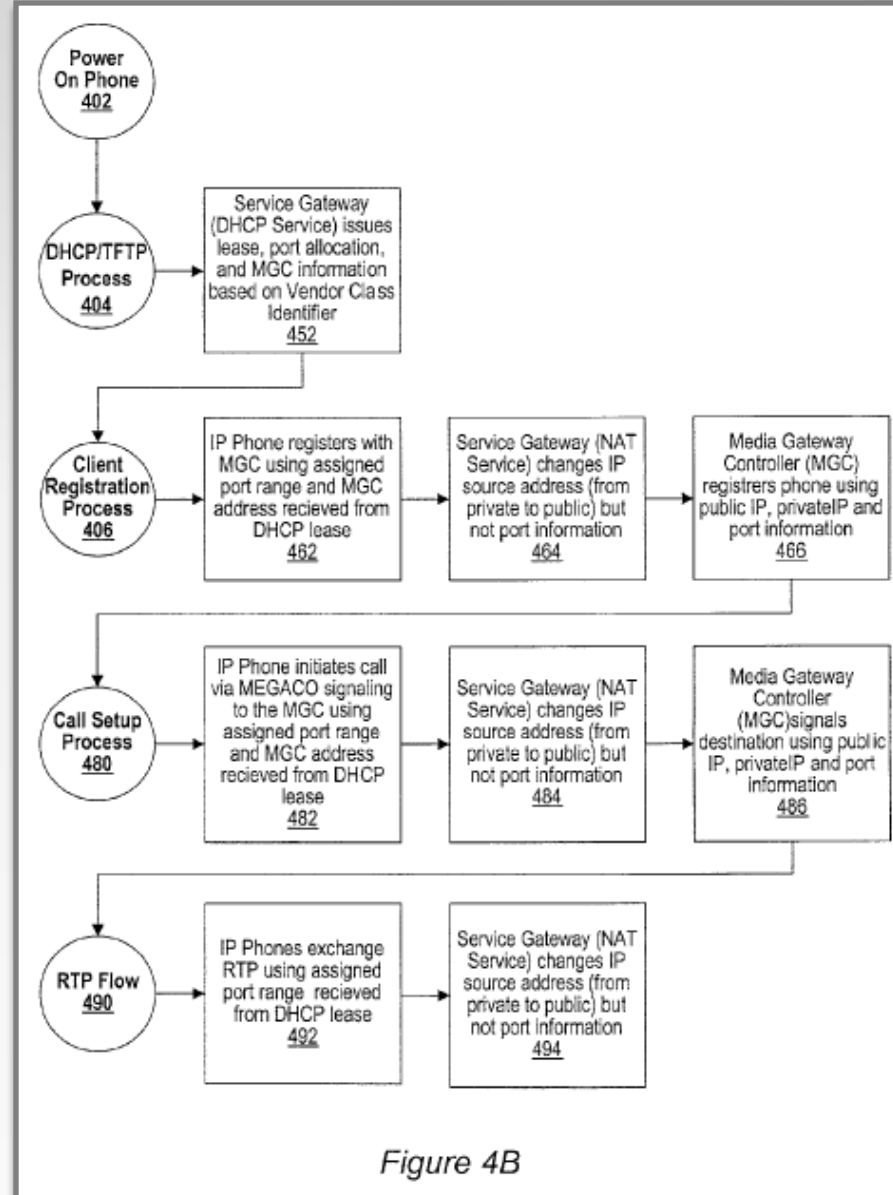


Figure 4B

Petition: Fangman's NAPPT uses port ranges

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

U.S. Patent No. 8,693,369

“Method of Routing a Data Packet in a Network and an Associated Device”

IPR2024-00175

PETITION FOR *INTER PARTES* REVIEW

(b) 1[a]

Fangman in view of Kumar renders obvious limitation 1[a]: “determining a port mask [e.g., **Kumar’s port mask**] assigned to the destination equipment [e.g., **Fangman’s IP telephones 120**], the port mask defining a range of port numbers [e.g., **Fangman’s range of port numbers**] to which the destination port number belongs.” EX1003, ¶¶152-62.

When service gateway **170** receives an IP data packet destined for IP telephone **120**, the service gateway must perform “NAPPT on the data packet” to “change the public destination IP address to a private destination IP address” for the IP telephone. *Id.*, 4:17-33, 18:30-47. In particular, Fangman explains that to perform NAPPT on received data packets, the service gateway “maintain[s] a table” that “map[s]” the port range assigned to an IP telephone to its internal (or “private”) IP address. *Id.*, 8:45-58, 10:66-67, 11:14-15; EX1003, ¶153. Thus, a POSITA would have understood that the service gateway **170** consults its mapping table to determine “the assigned range of port numbers” to which the “destination port number” in the IP packet belongs, and then replaces the public IP address in the

Petition 43-44

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
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U.S. Patent No. 8,693,369

"Method of Routing a Data Packet in a Network and an Associated Device"

IPR2024-00175

DECLARATION OF DR. SAMRAT BHATTACHARJEE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,693,369

Juniper Exhibit 1003, page 1

EX1003 ¶ 169

IP address. *Id.*, 18:46-47, Abstract. For instance, Figure 10B of Fangman illustrates a service gateway routing the packet to "Phone 2" (yellow) after performing a NAPPT operation that changes the destination IP address of the packet from "Phone 2 Public... to Phone 2 private" (red):

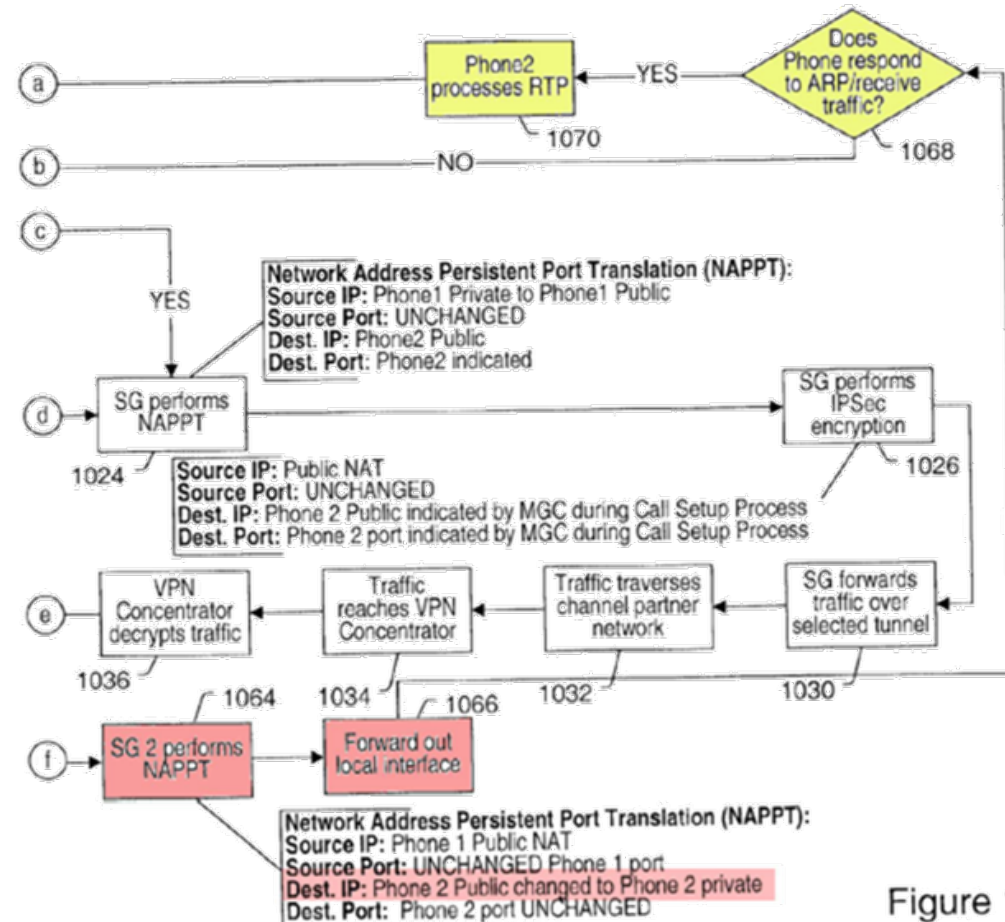


Figure 10B

Id., Fig. 10B (colors added), 30:12-41.

Fangman: NAPPT maintains mappings between IP addresses and port numbers



US007068647B2

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

(10) **Patent No.:** US 7,068,647 B2
(45) **Date of Patent:** *Jun. 27, 2006

(54) **SYSTEM AND METHOD FOR ROUTING IP PACKETS**

(75) **Inventors:** Richard E. Fangman, Pflugerville, TX (US); Jason D. Preston, Austin, TX (US)

(73) **Assignee:** Voxpath Networks, Inc., Austin, TX (US)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 868 days.
This patent is subject to a terminal disclaimer.

(21) **Appl. No.:** 09/903,836

(22) **Filed:** Jul. 11, 2001

(65) **Prior Publication Data**
US 2002/0141389 A1 Oct. 3, 2002

Related U.S. Application Data
(60) Provisional application No. 60/281,908, filed on Apr. 3, 2001.

(51) **Int. Cl.** H04L 12/66 (2006.01)
(52) **U.S. Cl.** 370/352; 370/389; 370/465; 370/401

(58) **Field of Classification Search** 370/352, 370/353, 354, 355, 401, 466, 475, 389
See application file for complete search history.

(56) **References Cited**
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6,061,349 A * 5/2000 Cole et al. 370/389

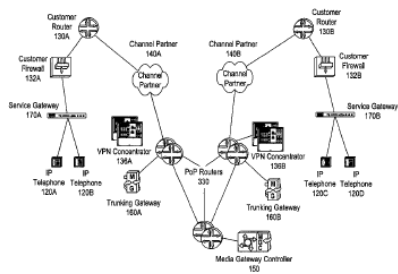
(Continued)

OTHER PUBLICATIONS
Written Opinion, Application No. PCT/US02/10544, mailed Feb. 26, 2004.
(Continued)

Primary Examiner—Ajit Patel
Assistant Examiner—Andrew C. Lee
(74) **Attorney, Agent, or Firm—**Meyertons Hood Kivlin Kowert & Goetzel, P.C.; Jeffrey C. Hood; Mark S. Williams

(57) **ABSTRACT**
System and method for routing packets for IP telephony. The system includes an IP telephone (IPT) and a Service Gateway (SG) coupled via a network. The SG receives a data packet from the IPT, including a private source IP address (SIPA), source port number (SPN), and destination information for an IP device, performs network address persistent port translation (NAPPT) on the data packet, and sends it to the IP device. NAPPT changes the private SIA to a public SIA, leaving the SPN unchanged. The SG receives a data packet from the IP device, including a public destination IP address (DIPA, i.e., said public SIA), a destination port number (DPN, i.e., said SPN), and source information, NAPPTs the data packet, using the public DIPA and the DPN to identify the IPT, changing the public DIPA to the private SIPA, leaving the DPN unchanged, and sends the data packet to the IPT.

43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024, page

NAT/NAPT/NAPPT

Instead of dynamically assigning ports to IP telephones, the SG 170 may allocate a range of port numbers for each IP telephone 120 as it acquires its lease during a DHCP process, described below with reference to FIGS. 5A and 5B. The SG 170 may maintain a table of semi-permanent mappings of the external IP address and ports to the internal hosts and ports. The SG 170 may continue to replace the internal or private source IP address with the NATed external source IP address. It may not, however, modify the port information, though it may validate it to ensure the correct internal host is using its assigned port range. Such Network Address Translation may be referred to as Network Address Persistent Port Translation (NAPPT).

EX1024 8:44-57

Fangman: NAPPT uses “the port number” to route devices



US007068647B2

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

(10) Patent No.: US 7,068,647 B2
(45) Date of Patent: *Jun. 27, 2006

(54) SYSTEM AND METHOD FOR ROUTING IP PACKETS

(75) Inventors: **Richard E. Fangman**, Pflugerville, TX (US); **Jason D. Preston**, Austin, TX (US)

(73) Assignee: **Voxpath Networks, Inc.**, Austin, TX
(US)

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(52) U.S. Cl. 370/352; 370/389; 370/465;
370/401

(58) **Field of Classification Search** 370/352,
370/353, 354, 355, 401, 466, 475, 389
See application file for complete search history.

(56) **References Cited**

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6,073.178	A *	6/2000	Wong et al.	709/229
6,178.455	B1 *	1/2001	Schutte et al.	709/228
6,286.038	B1 *	9/2001	Reichmeyer et al.	709/220
6,353.660	B1 *	3/2002	Burger et al.	379/88.17
6,381.638	B1 *	4/2002	Mahler et al.	709/220
6,385.653	B1 *	5/2002	Sitarman et al.	709/230
6,496.867	B1 *	12/2002	Beser et al.	709/245
6,515.997	B1 *	2/2003	Feltnet et al.	
6,523.668	B1 *	2/2003	Beser et al.	709/238
6,727.042	B1 *	6/2003	Fijolek et al.	370/465

(Continued)

OTHER PUBLICATIONS

Written Opinion, Application No. PCT/US02/10544, mailed Feb. 26, 2004.

(Continued)

Primary Examiner—Ajit Patel

Assistant Examiner—Andrew C. Lee

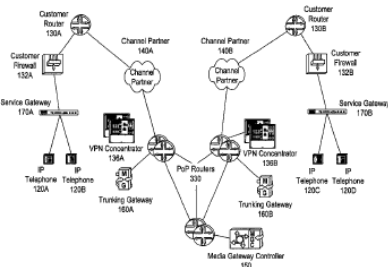
(74) *Attorney, Agent, or Firm*—Meyertons Hood Kivlin Kowert & Goetzel, P.C.; Jeffrey C. Hood; Mark S. Williams

(57)

ABSTRACT

The system and method for routing packets for IP telephony. The system includes an IP telephone (IPT) and a Service Gateway (SG) coupled via a network. The SG receives a data packet from the IPT, including a private source IP address (SIPA), source port number (SPN), and destination information for an IP device, performs network address persistent translation (NAPT) to change the SIPA to a public source IP address (DIPA), the SPN unchanged. The SG sends the data packet from the IP device, including a public destination IP address (DIPA, i.e., said public SIPA), a destination port number (DPN, i.e., said SPN), and source information, NAPT's the data packet, using the public DIPA and the DPN to identify the IPT, changing the public DIPA to the private SIPA, the DPN unchanged, and sends the data packet to the IPT.

43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024, page

In another embodiment, performing IP communications using the IP telephone may include the Service Gateway receiving a data packet from the IP device, including a public destination IP address, a destination port number in the assigned range of port numbers, and source information, where the public destination IP address and the destination port number may be used to uniquely identify the IP telephone. The Service Gateway may then perform a Network Address Persistent Port Translation (NAPPT) on the data packet, and send the data packet to the IP telephone.

Performing NAPPT on the data packet received from the destination may include using the public destination IP address and the destination port number to uniquely identify the IP telephone, and changing the public destination IP address to a private source IP address of the IP telephone while leaving the destination port number unchanged.

Fangman: NAPPT uses “the port number” to route devices



US007068647B2

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

(10) **Patent No.:** US 7,068,647 B2
(45) **Date of Patent:** *Jun. 27, 2006

(54) **SYSTEM AND METHOD FOR ROUTING IP PACKETS**

(75) Inventors: **Richard E. Fangman**, Pflugerville, TX (US); **Jason D. Preston**, Austin, TX (US)

(73) Assignee: **Voxpath Networks, Inc.**, Austin, TX (US)

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(52) U.S. Cl. 370/352; 370/389; 370/46
370/4

(58) **Field of Classification Search** 370/353, 370/353, 354, 355, 401, 466, 475, 31
See application file for complete search history.

(56) **References Cited**

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6,178,455	B1 *	1/2001	Schutte et al.	709/228
6,286,038	B1 *	9/2001	Reichmeyer et al.	709/220
6,353,660	B1 *	3/2002	Burger et al.	379/88.17
6,381,638	B1 *	4/2002	Mahler et al.	709/220
6,385,653	B1 *	5/2002	Sitaraman et al.	709/230
6,496,867	B1 *	12/2002	Beser et al.	709/245
6,515,997	B1	2/2003	Feltner et al.	
6,523,068	B1 *	2/2003	Beser et al.	709/238
6,577,642	B1 *	6/2003	Fijolek et al.	370/465

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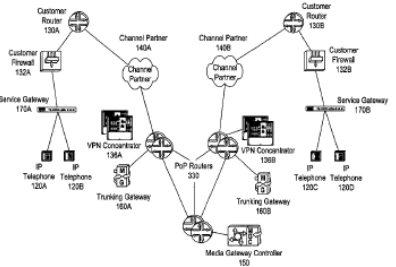
(74) *Attorney, Agent, or Firm*—Meyertons Hood Kivlin Kowert & Goetzel, P.C.; Jeffrey C. Hood; Mark S. Williams

(57)

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43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024, page

Conversely, when the SG 170 receives a data packet from the IP device destined for the IP telephone 120, the data packet may include a public destination IP address, a destination port number; and source information associated with the IP device, where the destination port number is in the assigned range of port numbers for the IP telephone 120.

In one embodiment, the public destination IP address and the destination port number may be used to uniquely identify the IP telephone 120. Performing a NAPPT on the data packet may include using the public destination IP address and the destination port number to uniquely identify the IP telephone 120, and changing the public destination IP address to a private destination IP address while leaving the destination port number unchanged. Note that in this embodiment, the private IP address may be an IP address of the IP telephone 120. After NAPPTing the data packet, the SG 170 may send the data packet to the IP telephone 120.

EX1024 18:31-46

MEGACO REGISTRATION FLOW
406

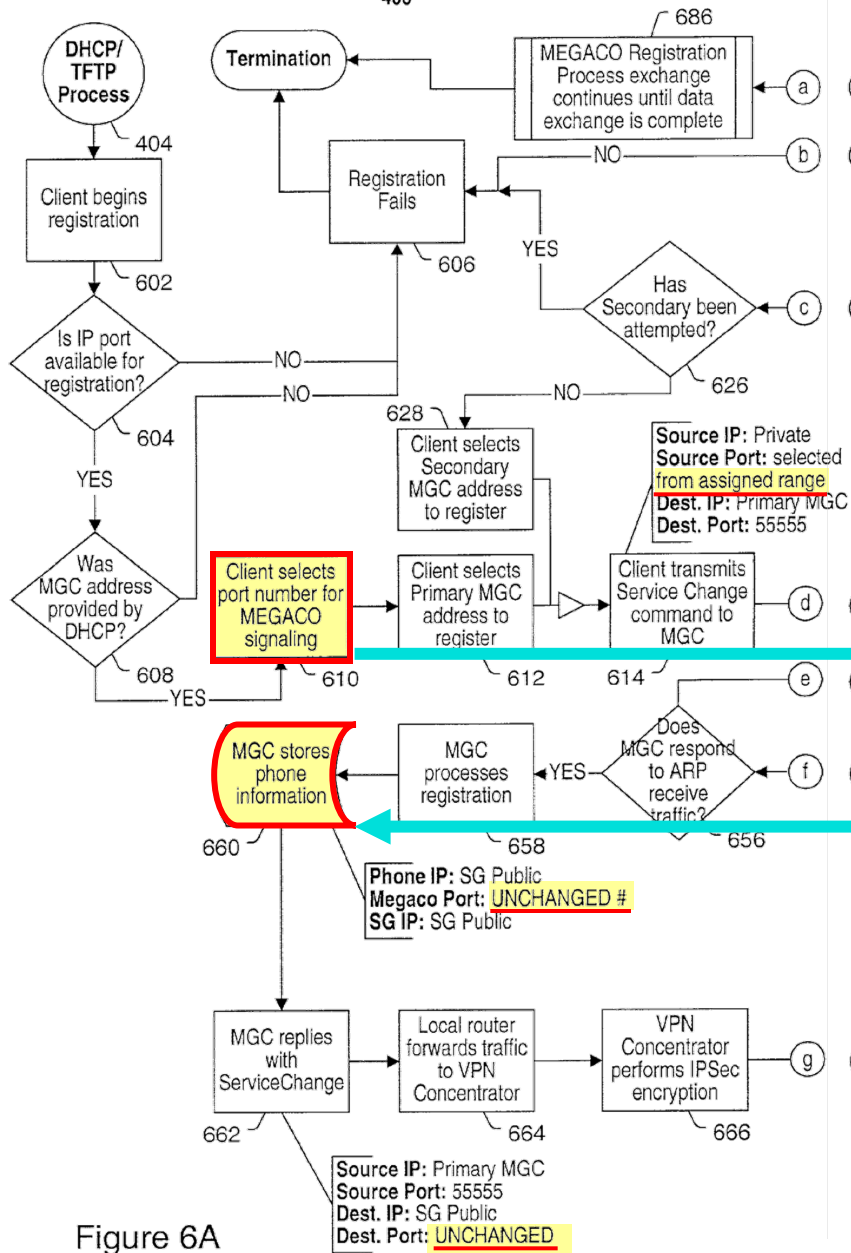


Figure 6A

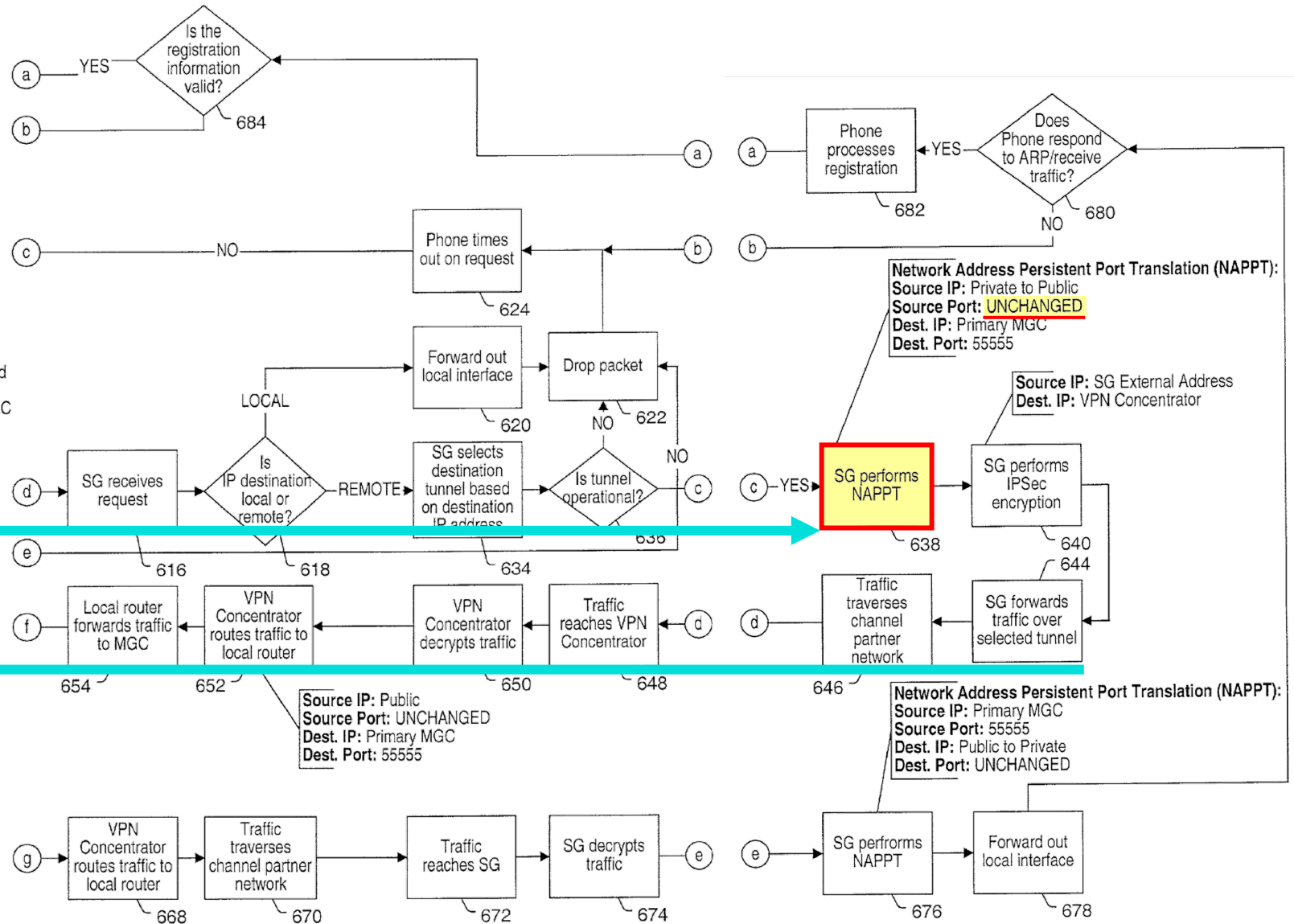
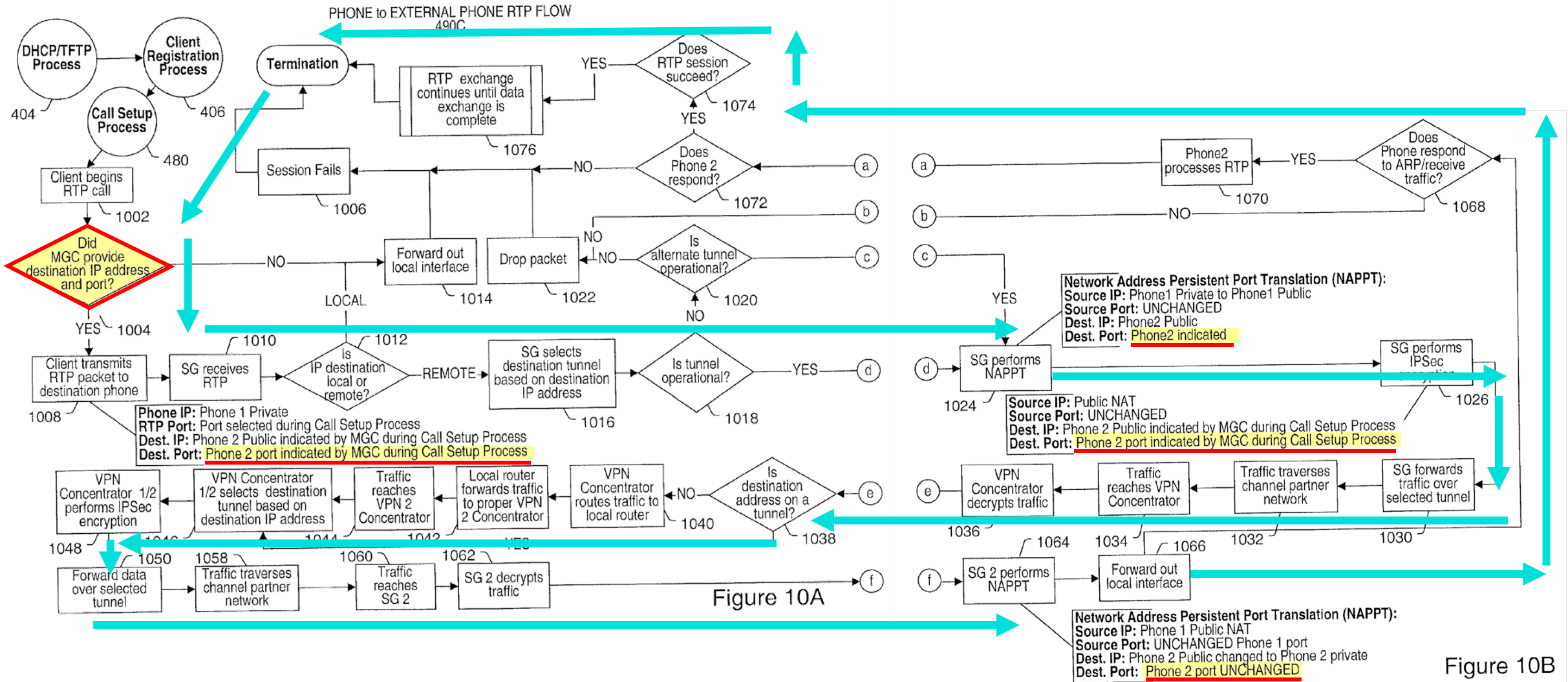


Figure 6B

Figure 6C

Fangman: Call Process



Fangman: "The port number" is identified during phone registration

(12) United States Patent Fangman et al.

(10) Patent No.: US 7,068,647 B2
(45) Date of Patent: *Jun. 27, 2006

(54) SYSTEM AND METHOD FOR ROUTING IP PACKETS

(75) Inventors: Richard E. Fangman, Pflugerville, TX (US); Jason D. Preston, Austin, TX (US)

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(58) Field of Classification Search 370/352, 370/353, 354, 355, 401, 466, 475, 389 See application file for complete search history.

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6,286,038 B1 * 9/2001 Reichmeyer et al. 709/220
6,353,660 B1 * 3/2002 Burger et al. 379/88,17
6,381,638 B1 * 4/2002 Mahler et al. 709/220
6,385,653 B1 * 5/2002 Stannan et al. 709/230
6,496,867 B1 * 12/2002 Besser et al. 709/245
6,515,997 B1 2/2003 Feltner et al.
6,523,068 B1 * 2/2003 Besser et al. 709/238
6,577,642 B1 * 6/2003 Fijolek et al. 370/465

(Continued)

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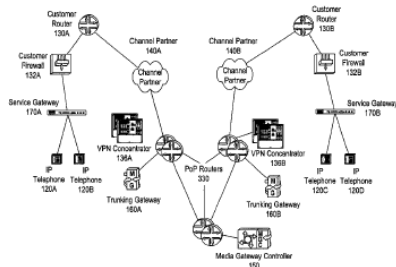
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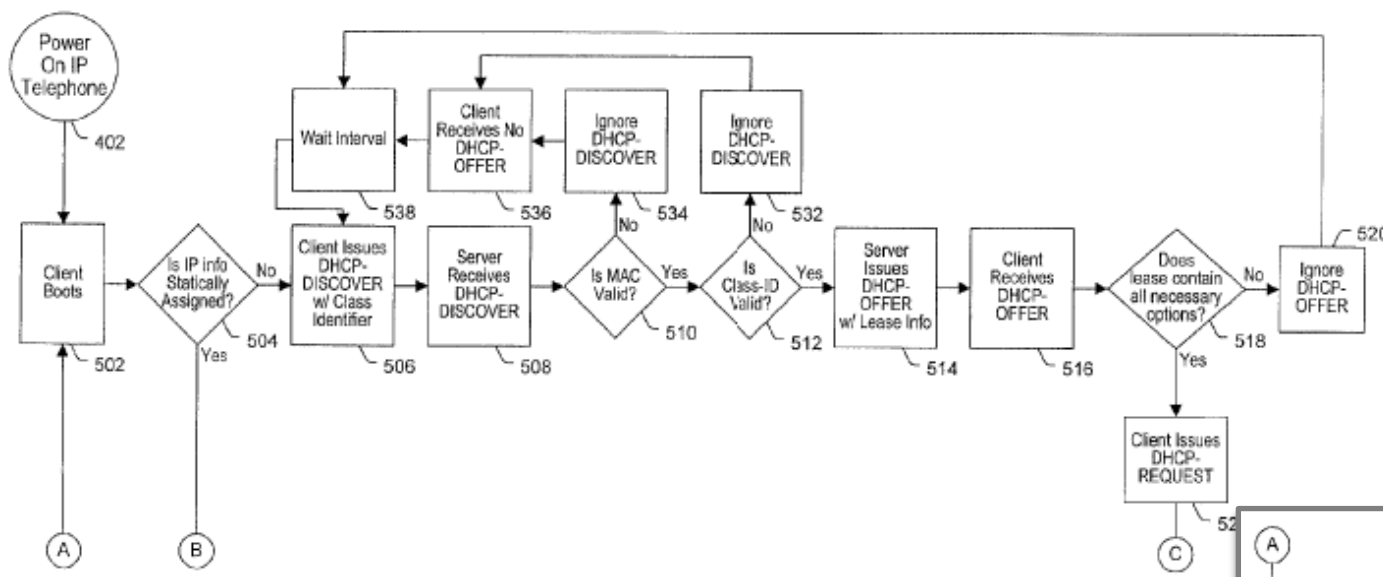
43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024, page

In step 1004 the system may determine if the MGC 150 provided a destination IP address and port. If the MGC 150 did not provide a destination IP address and port, then in step 1006 the session may fail, and the process may terminate. If the MGC 150 did provide a destination IP address and port, then in step 1008, the client may transmit an RTP packet to the destination telephone, i.e., IP telephone 120C. In one embodiment, the packet header for the data now may include the source IP address set to Phone 1 Private, the RTP port set to the port selected during the Call Setup process, the destination IP address, set to Phone 2 Public indicated by the MGC during the Call Setup process, and the destination port, set to Phone 2 port indicated by the MGC during the Call Setup process.

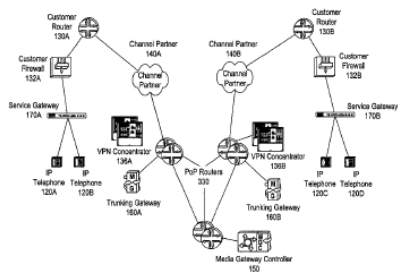
EX1024 29:7-14



(21) Appl. No.: 09/903,836
 (22) Filed: Jul. 11, 2001
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 US 2002/0141389 A1 Oct. 3, 2002
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 (52) U.S. Cl. 370/352; 370/389; 370/465; 370/401
 (58) Field of Classification Search 370/352, 370/353, 354, 355, 401, 466, 475, 389
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43 Claims, 22 Drawing Sheets



Juniper Exhibit 1024, page

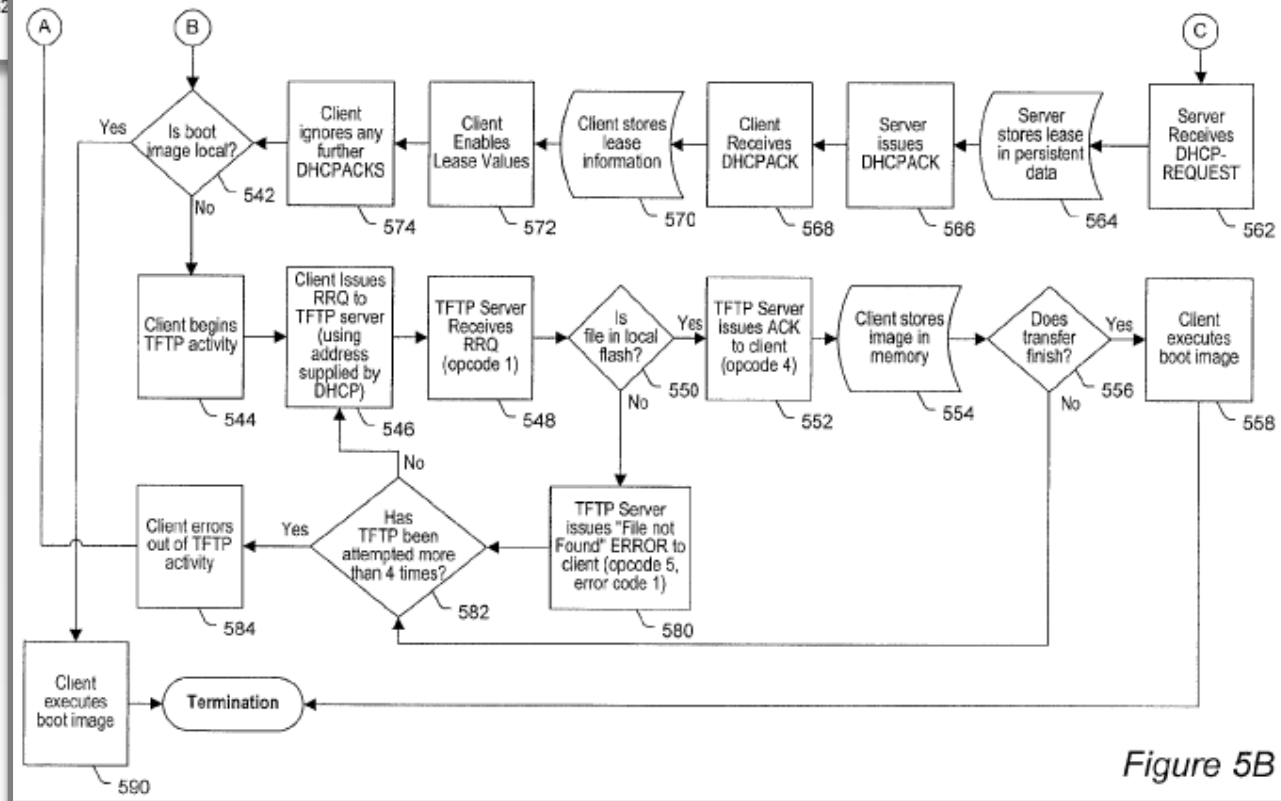


Figure 5B

EX1024 Fig 5a-B

MEGACO REGISTRATION FLOW
406

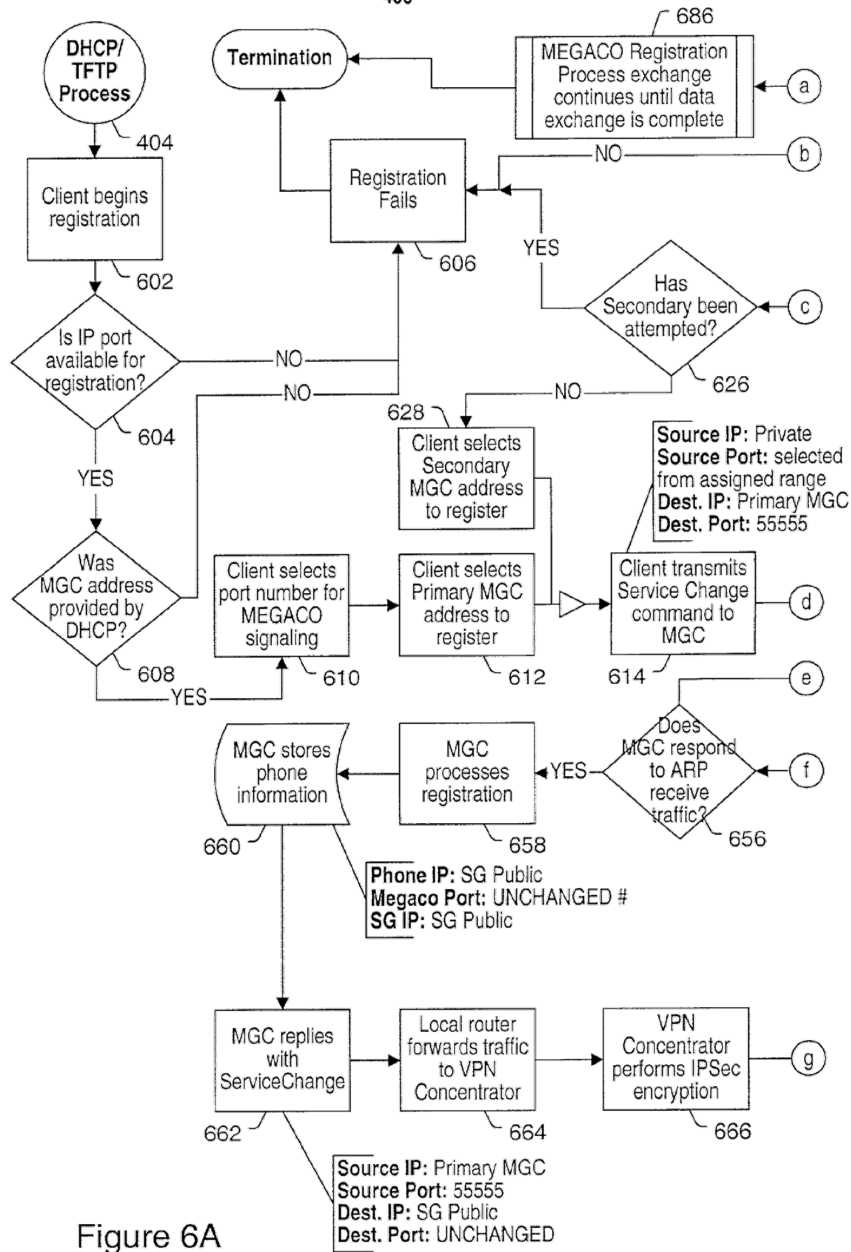


Figure 6A

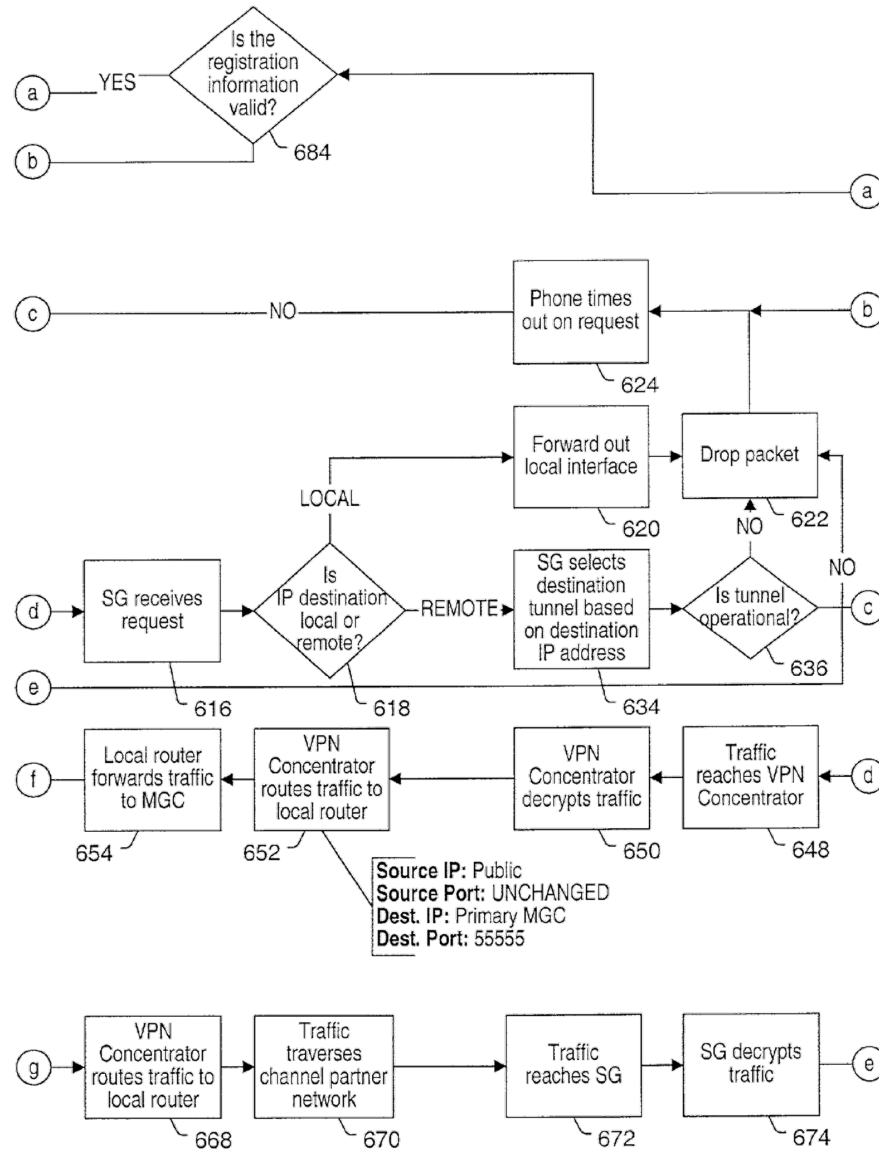


Figure 6B

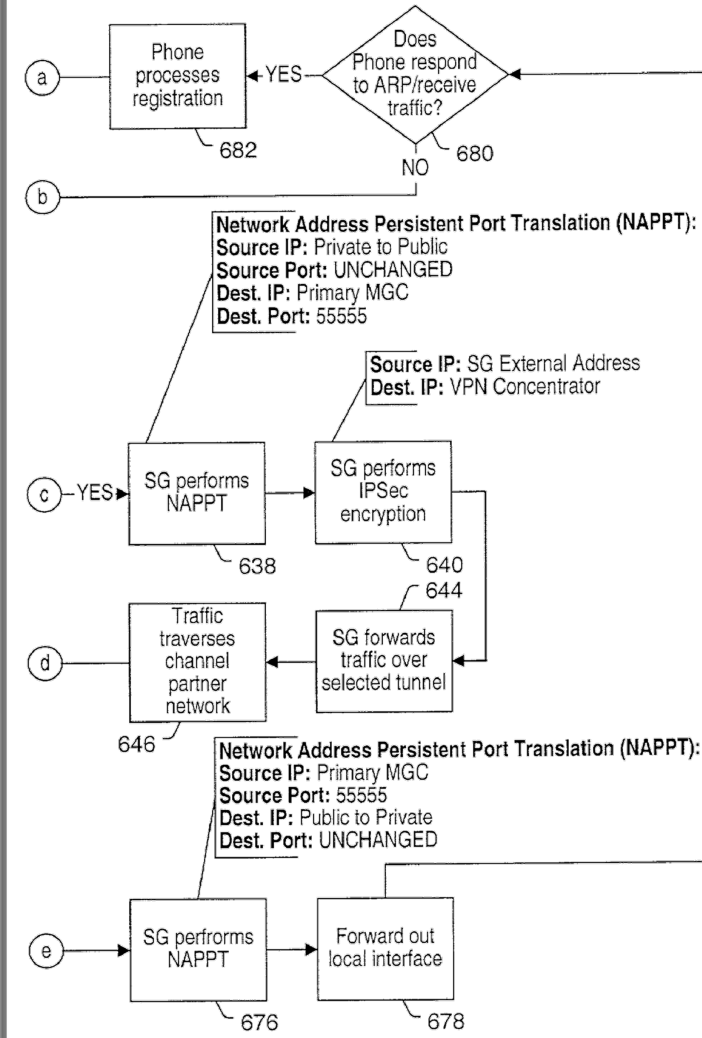


Figure 6C

INTERNAL PHONE to INTERNAL PHONE RTP FLOW 490A

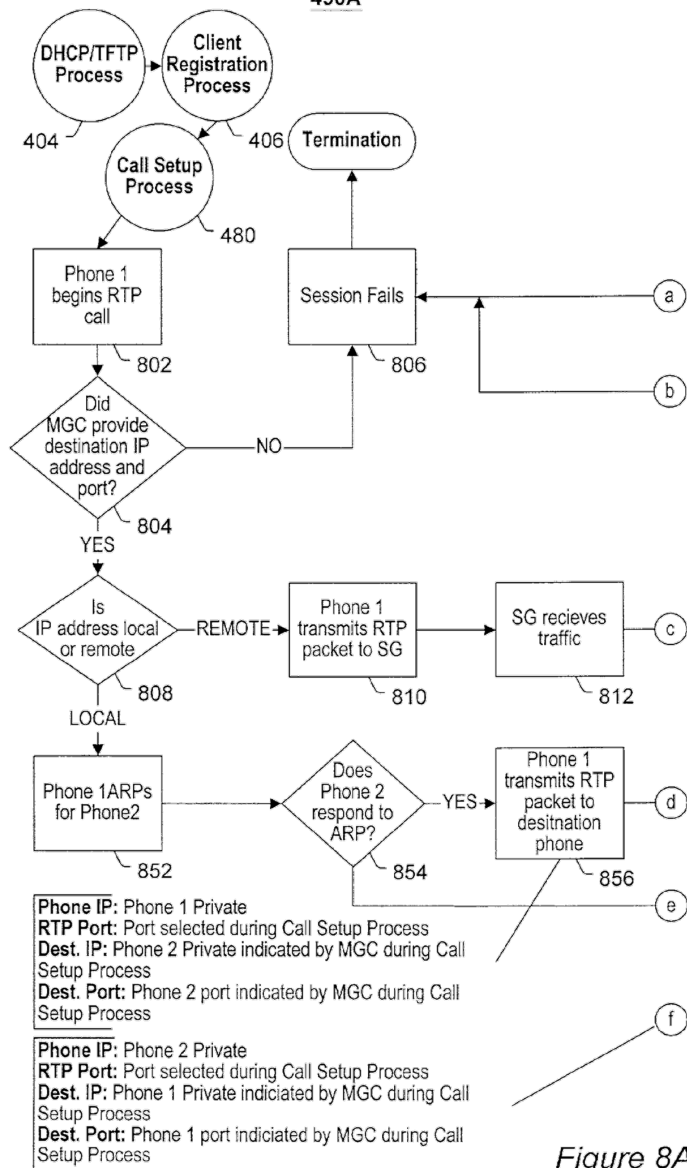


Figure 8A

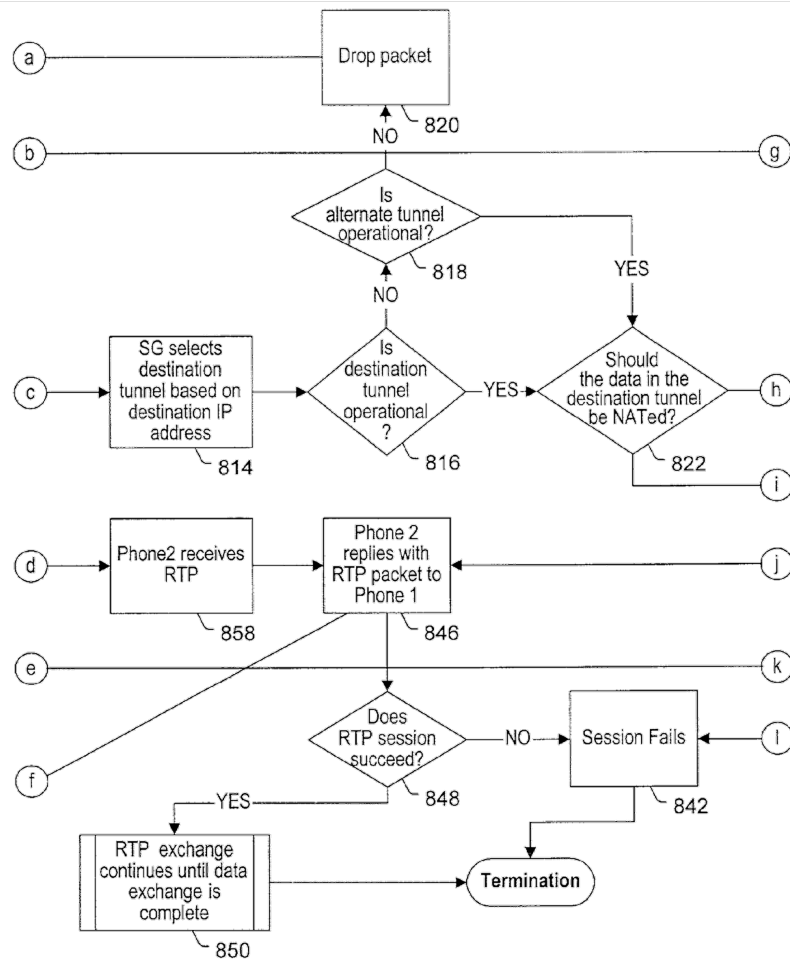


Figure 8B

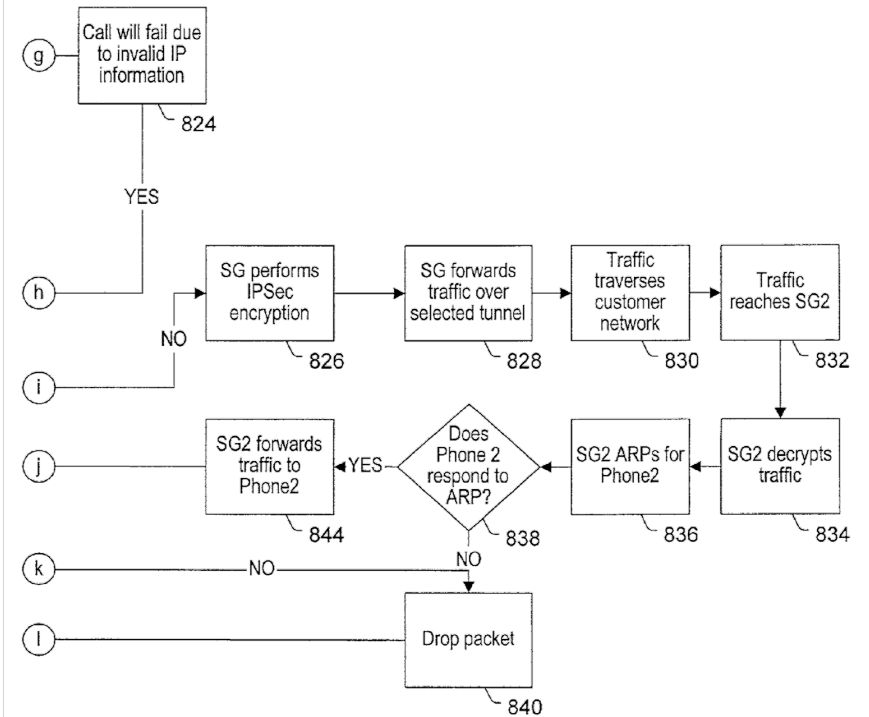


Figure 8C

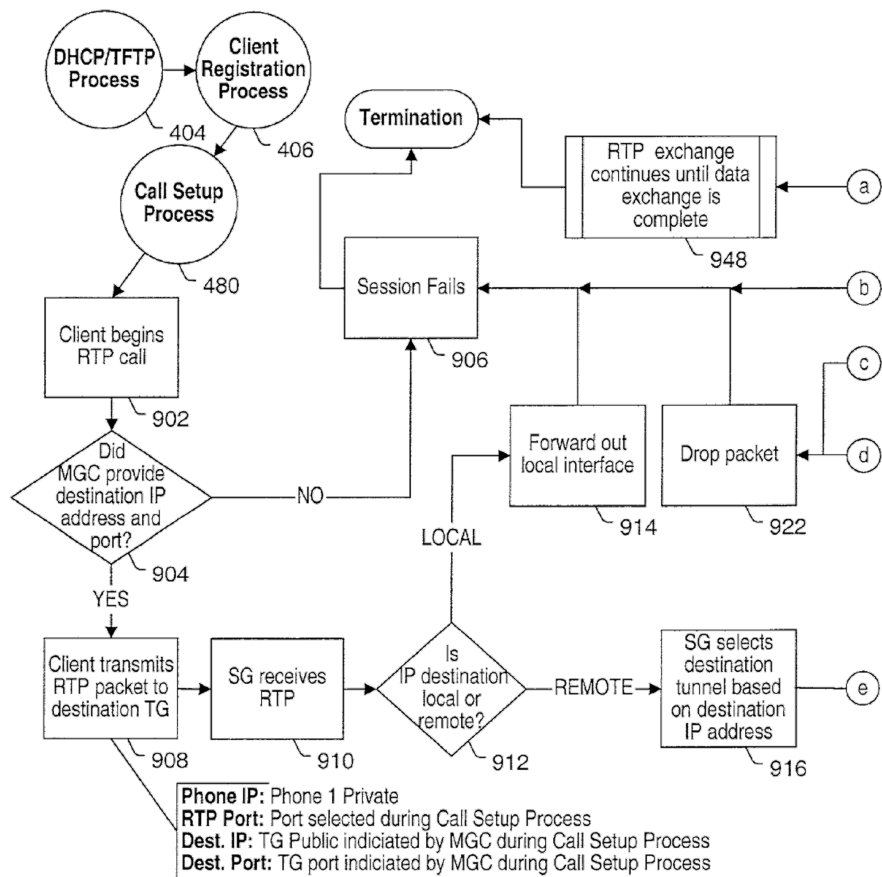


Figure 9A

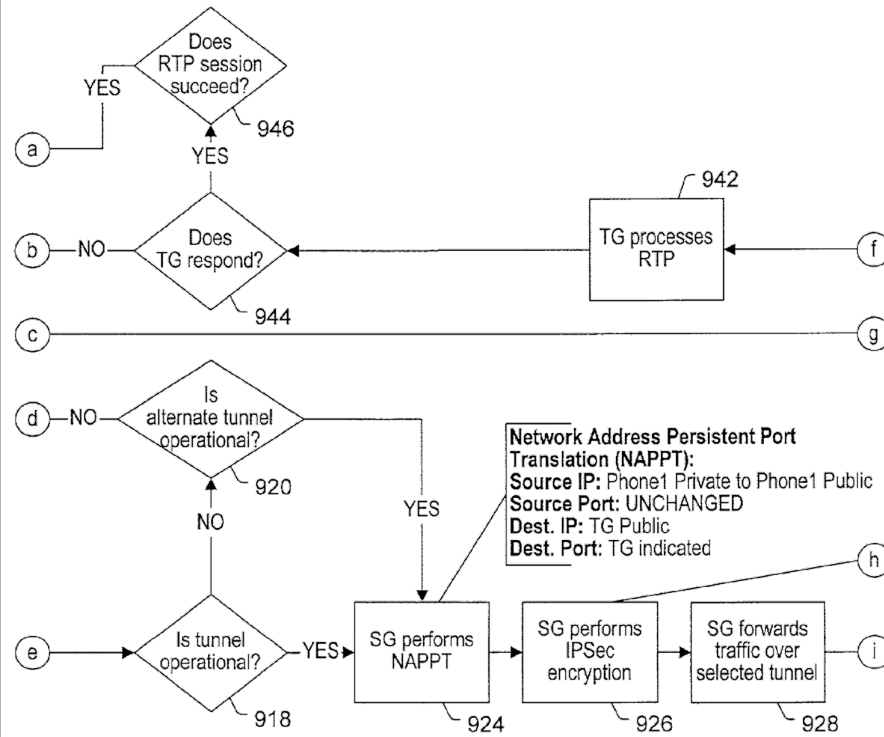


Figure 9B

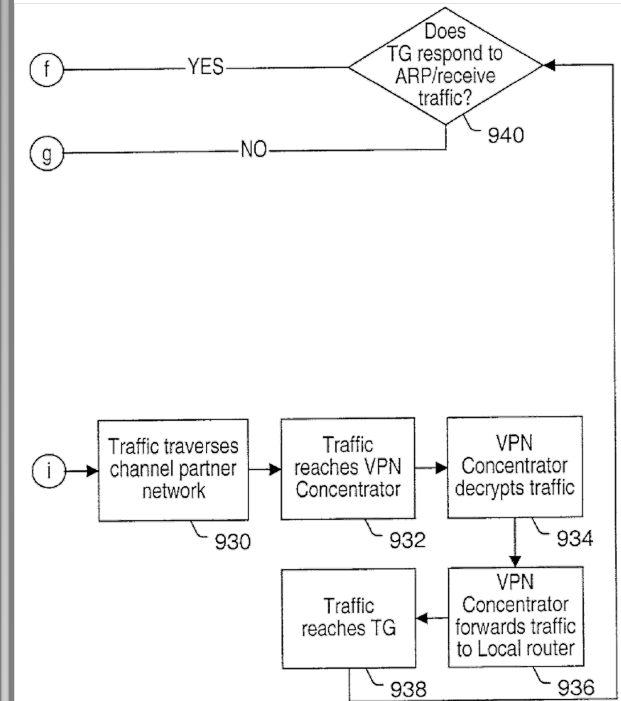


Figure 9C

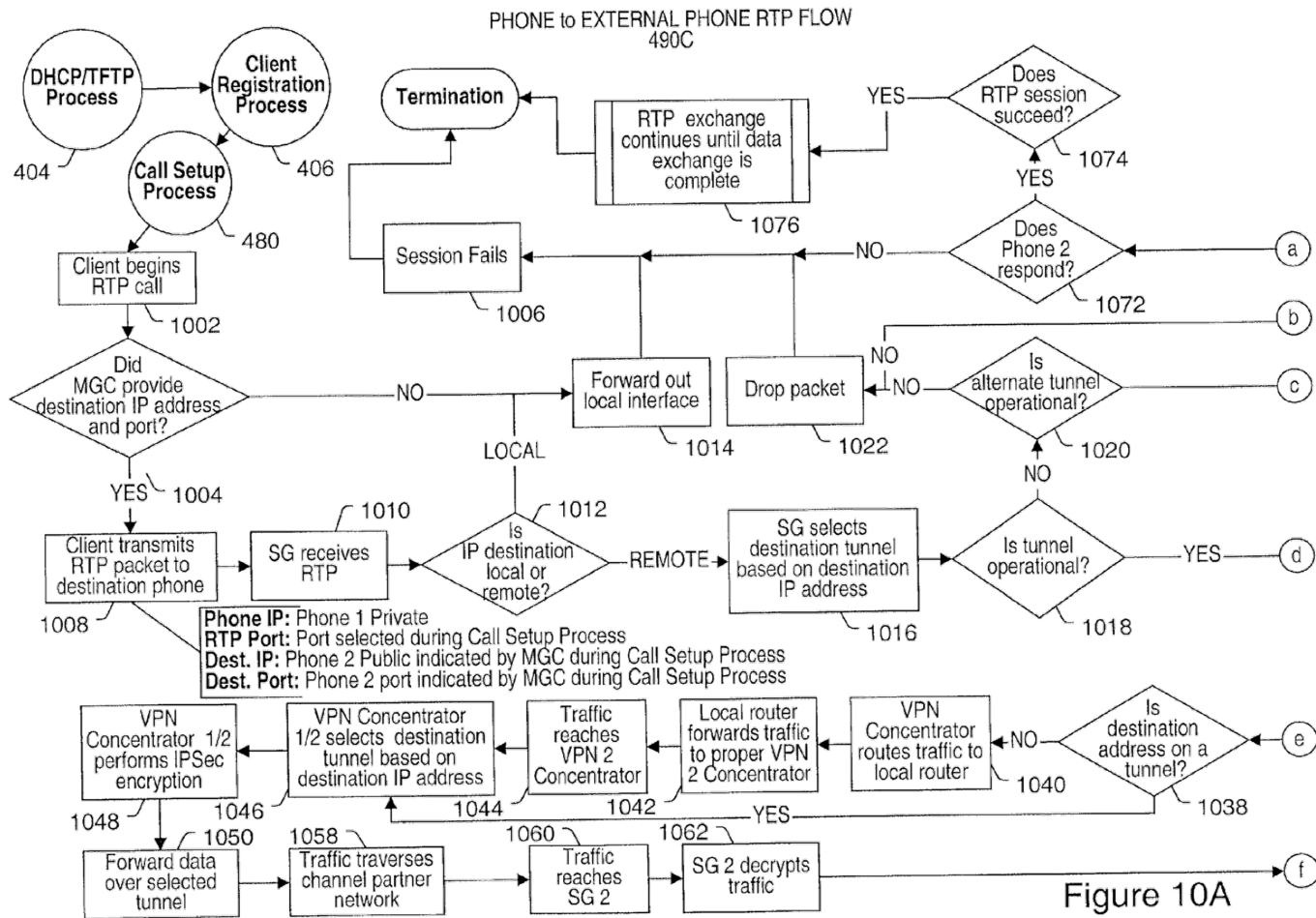


Figure 10A

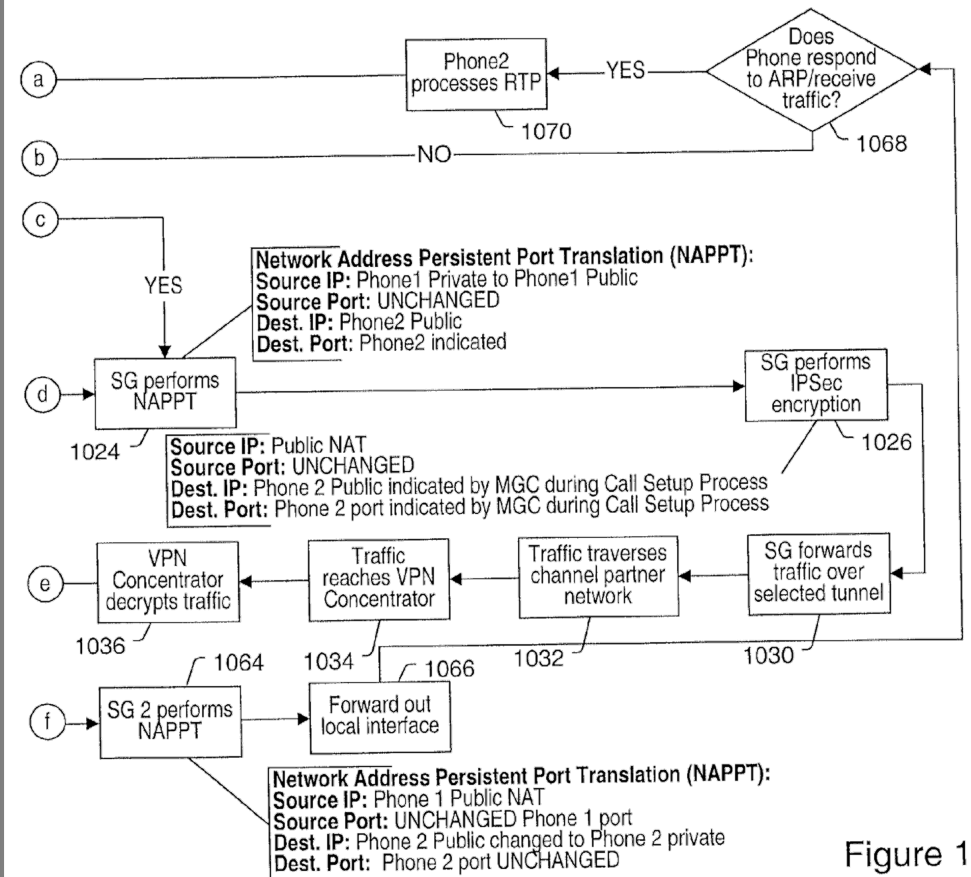


Figure 10B

The '369 Patent

Key Points

- Grounds 2 & 4, Claims 1, 5, and 6
 - Fangman does not disclose routing a packet based on port ranges
- **Grounds 3 & 5, Claims 1, 5, and 6**
 - **King does not disclose routing a packet based on port ranges**
- All Grounds, All Claims
 - A POSITA would not modify any of the art to use port masks as claimed
- Ground 1, Claims 8 & 12
 - Biswas does not disclose a routing identifier

King: Identifying Users at the Aggregation Device

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

(10) Patent No.
(45) Date of

(54) **APPARATUS AND METHOD FOR PROVIDING DATA SESSION SOURCE DEVICE INFORMATION**

(75) Inventors: **Matthew Lawrence King**, Hampshire (GB); **Frank Brockners**, Köln (DE); **Richard Mandred Pruss**, Queensland (AU); **Wayne Roiger**, Golden Valley, MN (US)

(73) Assignee: **Cisco Technology, Inc.**, San Jose, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1045 days.

(21) Appl. No.: **11/439,930**

(22) Filed: **May 23, 2006**

(65) **Prior Publication Data**
US 2007/0276957 A1 Nov. 29, 2007

(51) Int. Cl.
G06F 15/16 (2006.01)
G06F 15/173 (2006.01)
H04L 12/28 (2006.01)

(52) U.S. Cl. **709/227; 709/238; 370/351**

(58) **Field of Classification Search** **709/227; 709/238; 370/351**
See application file for complete search history.

(56) U.S. PATENT DOCUMENTS
6,563,824 B1 *
7,003,574 B1 *
2002/0049840 A1 *
2003/0007486 A1 *
2003/0084162 A1 *
2003/0106067 A1 *
2003/0108052 A1 *
2006/0062203 A1 *
OTHER PUBLICATIONS
Information Sciences
"Transmission Control
Specification," (IETF
* cited by examiner
Primary Examiner
(74) Attorney, Agent
& Becker LLP
(57)
A community transla
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arranged to receive
community. The tra
fier and, as a source
community translati
component and a da
session identifiers &
translation compone
session identifier to
ciated with the sou
vice device further b
including the assign
source device inform

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT
400	402	404	406
100-102	1024	IP1	1101
118-102	1024	IP2	1034
100-116	1025	IP1	1042
118-116	1025	IP2	1106

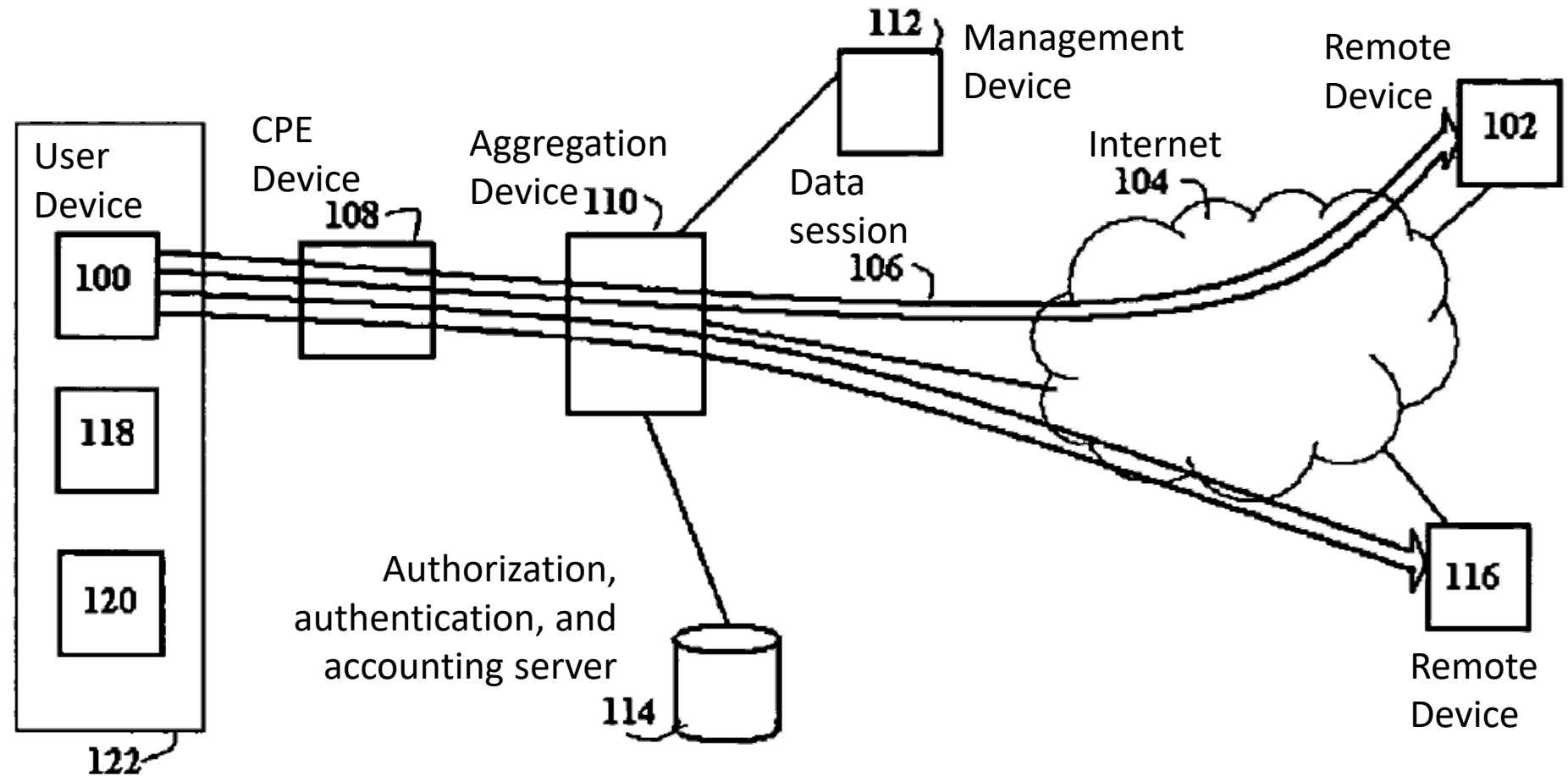


FIG. 1

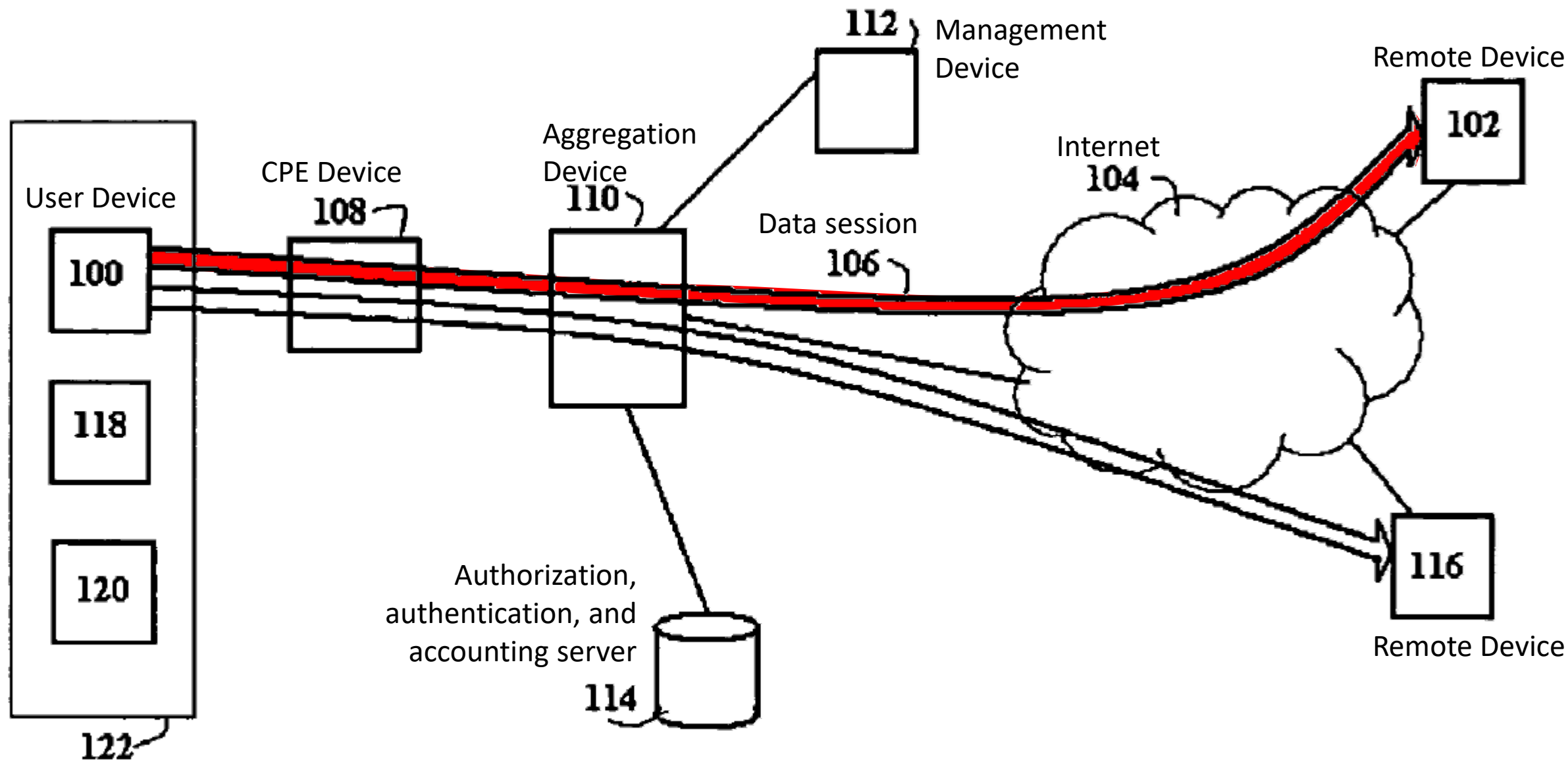


FIG. 1

King: Identifying Users at the Aggregation Device



US008032639B2

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

(10) **Patent No.:** US 8,032,639 B2
(45) **Date of Patent:** Oct. 4, 2011

(54) **APPARATUS AND METHOD FOR PROVIDING DATA SESSION SOURCE DEVICE INFORMATION**

(75) **Inventors:** Matthew Lawrence King, Hampshire (GB); Frank Brockners, Köln (DE); Richard Mandred Pruss, Queensland (AU); Wayne Rojger, Golden Valley, MN (US)

(73) **Assignee:** Cisco Technology, Inc., San Jose, CA (US)

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1045 days.

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(65) **Prior Publication Data**
US 2007/0276957 A1 Nov. 29, 2007

(51) **Int. Cl.**
G06F 15/16 (2006.01)
G06F 15/173 (2006.01)
H04L 12/28 (2006.01)

(52) **U.S. Cl.** 709/227; 709/238; 370/351

(58) **Field of Classification Search** 709/227, 709/238, 370/351
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,563,824 B1 * 5/2003 Bhatia et al. 370/392
7,003,574 B1 * 2/2006 Bahl 709/228
2002/0049840 A1 * 4/2002 Squire et al. 709/225
2003/0007486 A1 * 1/2003 March et al. 370/389
2003/0084162 A1 * 5/2003 Johnson et al. 709/227
2003/0106067 A1 * 6/2003 Hoskins et al. 725/119
2003/0108052 A1 * 6/2003 Inoue et al. 370/399
2006/0062203 A1 * 3/2006 Satapalli 370/352

OTHER PUBLICATIONS

Information Sciences Institute, University of Southern California, "Transmission Control Protocol DARPA Internet Program Protocol Specification," (IETF RFC 793), Sep. 1981, pp. 1-77.

* cited by examiner

Primary Examiner — Ranodhi Serrao

(74) **Attorney, Agent, or Firm** — Hickman Palermo Truong & Becker LLP

(57) **ABSTRACT**

A community translation service device for providing a translation service to a community of at least one source device is arranged to receive data traffic from a source device in the community. The traffic includes a native data session identifier and, as a source identifier, a source device identifier. The community translation service device comprises a translation component and a database for storing a pool of assigned data session identifiers associated with the source device. The translation component is arranged to translate the native data session identifier to an assigned data session identifier associated with the source device, the community translation service device further being arranged to forward the data traffic including the assigned data session identifier as data session source device information to a service aggregation device.

19 Claims, 6 Drawing Sheets

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT	OUTPUT SOURCE ADDRESS
400	402	404	406	408
100-102	1024	IP1	1101	IPCPE
118-102	1024	IP2	1034	IPCPE
100-116	1025	IP1	1042	IPCPE
118-116	1025	IP2	1106	IPCPE

Juniper Exhibit 1025, page 1

500
USER DEVICE INITIATES SERVICE SESSION

502
CPE TRANSLATES SOURCE IDENTIFIER

504
CPE ASSIGNS SOURCE TCP PORT

506
FORWARD RETURNING TRAFFIC TO USER DEVICE

FIG. 5

EX1025 Fig. 5

King: Identifying Users Using Source Information



US008032639B2

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

(10) **Patent No.:** US 8,032,639 B2
(45) **Date of Patent:** Oct. 4, 2011

(54) **APPARATUS AND METHOD FOR
PROVIDING DATA SESSION SOURCE
DEVICE INFORMATION**

(75) **Inventors:** **Matthew Lawrence King**, Hampshire
(GB); **Frank Brockners**, Köln (DE);
Richard Mandred Pruss, Queensland
(AU); **Wayne Roiger**, Golden Valley,
MN (US)

(73) **Assignee:** **Cisco Technology, Inc.**, San Jose, CA
(US)

(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
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(51) **Int. Cl.**
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(52) **U.S. Cl.** 709/227; 709/238; 370/351

(58) **Field of Classification Search** 709/227;
709/238; 370/351
See application file for complete search history.

(56) **References Cited**

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"Transmission Control Protocol DARPA Internet Program Protocol
Specification," (IETF RFC 793), Sep. 1981, pp. 1-77.

* cited by examiner

Primary Examiner—Ranodhi Serrao

(74) **Attorney, Agent, or Firm**—Hickman Palermo Truong
& Becker LLP

(57) **ABSTRACT**

A community translation service device for providing a trans-
lation service to a community of at least one source device is
arranged to receive data traffic from a source device in the
community. The traffic includes a native data session identi-
fier and, as a source identifier, a source device identifier. The
community translation service device comprises a translation
component and a database for storing a pool of assigned data
session identifiers associated with the source device. The
translation component is arranged to translate the native data
session identifier to an assigned data session identifier asso-
ciated with the source device, the community translation ser-
vice device further being arranged to forward the data traffic
including the assigned data session identifier as data session
source device information to a service aggregation device.

19 Claims, 6 Drawing Sheets

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT	OUTPUT SOURCE ADDRESS
400	402	404	406	408
100-102	1024	IP1	1101	IPCPE
118-102	1024	IP2	1034	IPCPE
100-116	1025	IP1	1042	IPCPE
118-116	1025	IP2	1106	IPCPE

Juniper Exhibit 1025, page 1

One known approach for this step is described in U.S. Pat. No. 6,983,332 of Lou et al., “Port-bundle host-key mechanism,” commonly assigned herewith and incorporated herein by reference for all purposes as if fully set forth herein.

In particular at step **500** the user device initiates a service session with its IP address as source identifier and a native data session identifier such as a TCP source port as data session identifier. At step **502** the CPE translates the source address to its own overloaded IP address. At step **504** the CPE additionally translates the TCP source port to its own TCP port in a Port Address Translation (PAT) step as described in more detail below. Then, as step **506**, the CPE forwards returning traffic with the translated overloaded IP address and TCP port to the user device, reinstating the user device IP address as destination address and the user device assigned TCP port number.

EX1025 2:25-28, 2:62-3:6

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

King: Identifying Users Using Source Information



US008032639B2

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

(10) **Patent No.:** US 8,032,639 B2
(45) **Date of Patent:** Oct. 4, 2011

(54) **APPARATUS AND METHOD FOR PROVIDING DATA SESSION SOURCE DEVICE INFORMATION**

(75) **Inventors:** **Matthew Lawrence King**, Hampshire (GB); **Frank Brockners**, Köln (DE); **Richard Mandred Pruss**, Queensland (AU); **Wayne Roiger**, Golden Valley, MN (US)

(73) **Assignee:** **Cisco Technology, Inc.**, San Jose, CA (US)

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G06F 15/16 (2006.01)
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(52) **U.S. Cl.** 709/227; 709/238; 370/351

(58) **Field of Classification Search** 709/227, 709/238, 370/351
See application file for complete search history.

(56) **References Cited**

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Information Sciences Institute, University of Southern California, "Transmission Control Protocol DARPA Internet Program Protocol Specification," (IETF RFC 793), Sep. 1981, pp. 1-77.

* cited by examiner

Primary Examiner — Ranodhi Serrao

(74) **Attorney, Agent, or Firm** — Hickman Palermo Truong & Becker LLP

(57) **ABSTRACT**

A community translation service device for providing a translation service to a community of at least one source device is arranged to receive data traffic from a source device in the community. The traffic includes a native data session identifier and, as a source identifier, a source device identifier. The community translation service device comprises a translation component and a database for storing a pool of assigned data session identifiers associated with the source device. The translation component is arranged to translate the native data session identifier to an assigned data session identifier associated with the source device, the community translation service device further being arranged to forward the data traffic including the assigned data session identifier as data session source device information to a service aggregation device.

19 Claims, 6 Drawing Sheets

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT	OUTPUT SOURCE ADDRESS
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118-102	1024	IP2	1034	IPCPE
100-116	1025	IP1	1042	IPCPE
118-116	1025	IP2	1106	IPCPE

Juniper Exhibit 1025, page 1

In overview the method and apparatus described herein provides additional data session source device information for identification of the user device at a service (or session) aggregation device which aggregates source host sessions such that the service aggregation device can ensure that a per-user device policy is applied. In particular, referring to FIG. 1 additional components which do not constitute the prior comprise a translation component 124 for providing the relevant information at the community translation service device or CPE from a database 126 the contents of which are shown in more detail in FIG. 6 which is a table showing the source and port information assigned according to the method described herein. The table of FIG. 6 corresponds generally to the table of FIG. 4 and so common reference numerals are used in both cases. However it will be seen that the TCP ports assigned in the output port column 600 are changed. In particular the native data session identifier in the form of the originally assigned TCP port is mapped by a translation component to an assigned data session identifier from a pool of port numbers stored in a database and associated with the respective source device. For example the CPE may assign

King: Identifying Users Using Source Information



US08032639B2

(12) **United States Patent**
King et al. (10) **Patent No.:** **US 8,032,639 B2**
(45) **Date of Patent:** **Oct. 4, 2011**

(54) **APPARATUS AND METHOD FOR PROVIDING DATA SESSION SOURCE DEVICE INFORMATION** (56) **References Cited**

(75) **Inventors:** **Matthew Lawrence King**, Hampshire (GB); **Frank Brockners**, Köln (DE); **Richard Mandred Pruss**, Queensland (AU); **Wayne Roiger**, Golden Valley, MN (US)

(73) **Assignee:** **Cisco Technology, Inc.**, San Jose, CA (US)

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(52) **U.S. Cl.** **709/227; 709/238; 370/351**

(58) **Field of Classification Search** **709/227; 709/238; 370/351**
See application file for complete search history.

19 Claims, 6 Drawing Sheets

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT	OUTPUT SOURCE ADDRESS
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118-102	1024	IP2	1034	IPCPE
100-116	1025	IP1	1042	IPCPE
118-116	1025	IP2	1106	IPCPE

Juniper Exhibit 1025, page 1

CONNECTION	INPUT PORT	INPUT SOURCE ADDRESS	OUTPUT PORT	OUTPUT SOURCE ADDRESS
400	402	404	600	408
100-102	1024	IP1	1024	IPCPE
118-102	1024	IP2	1040	IPCPE
100-116	1025	IP1	1025	IPCPE
118-116	1025	IP2	1041	IPCPE

FIG. 6

The '369 Patent

Key Points

- Grounds 2 & 4, Claims 1, 5, and 6
 - Fangman does not disclose routing a packet based on port ranges
- Grounds 3 & 5, Claims 1, 5, and 6
 - King does not disclose routing a packet based on port ranges
- **All Grounds, All Claims**
 - **A POSITA would not modify any of the art to use port masks as claimed**
- Ground 1, Claims 8 & 12,
 - Biswas does not disclose a routing identifier

Petitioner: Kumar's "Port Mask" Discloses the Claimed Port Mask

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

U.S. Patent No. 8,693,369

"Method of Routing a Data Packet in a Network and an Associated Device"

IPR2024-00175

PETITION FOR *INTER PARTES* REVIEW

(c) 7[b]

Biswas and Kumar render obvious limitation 7[b]: "assigning to said piece of terminal equipment [e.g., **Biswas's host 102a**] a port mask [e.g., **Kumar's port mask**] defining a range of numbers dedicated to it [e.g., **Biswas's global port range**] and a routing identifier [e.g., **Biswas's local address**]." EX1003, ¶¶87-101.

(b) 1[a]

Fangman in view of Kumar renders obvious limitation 1[a]: "determining a port mask [e.g., **Kumar's port mask**] assigned to the destination equipment [e.g., **Fangman's IP telephones 120**], the port mask defining a range of port numbers [e.g., **Fangman's range of port numbers**] to which the destination port number belongs." EX1003, ¶¶152-62.

(b) 1[a]

King and Kumar render obvious limitation 1[a]: "determining a port mask [e.g., **Kumar's port mask**] assigned to the destination equipment [e.g., **King's user device 100**], the port mask defining a range of port numbers [e.g., **King's port range assigned to user device 100**] to which the destination port number [e.g., **King's**

Petition 21, 43-44, 57

Petitioner: Bit Masks can Define a Range

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

U.S. Patent No. 8,693,369

"Method of Routing a Data Packet in a Network and an Associated Device"

IPR2024-00175

DECLARATION OF DR. SAMRAT BHATTACHARJEE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,693,369

Juniper Exhibit 1003, page 1

C. Masks

41. Masks are an efficient way of defining a range of numbers and determining whether a number is within that range. Masks are a bit operation, which means they are performed on binary numbers. For example, masks can be used to determine whether a number is within the range 0-15. In binary representation, that would be between 0 (corresponding to 0) and 1111 (corresponding to 15). Forming a mask for this range simply requires inverting the larger number and then padding the left side of that inverted number with binary 1s. For example, a mask for the range 0-15 could be 1111110000.

Petitioner: Bit Masks can Define a Range with the “AND” Function

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

U.S. Patent No. 8,693,369

“Method of Routing a Data Packet in a Network and an Associated Device”

IPR2024-00175

DECLARATION OF DR. SAMRAT BHATTACHARJEE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,693,369

Juniper Exhibit 1003, page 1

received number and every digit of the mask. A binary AND operation outputs a binary 1 if, and only if, the two inputted numbers are also 1s. For example, performing a binary AND between the received number, 0011100010, and the mask, 1111110000, would produce the result 0011100000, since the digits at the third,

number and every digit of the mask. Performing a binary AND between the received number, 0000000110, and the mask, 1111110000, would produce the result 0000000000 because the received number does not have a binary 1 in the same digit

Kumar: Packet Classification

(12) United States Patent Kumar et al.

(10) Patent No.: US 7,394,809 B2
(45) Date of Patent: Jul. 1, 2008

(54) METHOD AND APPARATUS FOR PACKET CLASSIFICATION USING A FOREST OF HASH TABLES DATA STRUCTURE

(75) Inventors: Alok Kumar, Santa Clara, CA (US);
Raj Yavatkar, Portland, OR (US)

(73) Assignee: Intel Corporation, Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 979 days.

(21) Appl. No.: 10/404,202

(22) Filed: Mar. 31, 2003

(65) Prior Publication Data
US 2004/0190526 A1 Sep. 30, 2004

(51) Int. Cl.
H04L 12/28 (2006.01)

(52) U.S. Cl. 370/392

(58) Field of Classification Search
See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS
5,615,341 A * 3/1997 Agrawal et al. 705/10
5,920,900 A * 7/1999 Poole et al. 711/216
5,951,651 A * 9/1999 Lakshman et al.
5,995,971 A * 11/1999 Douceur et al. 707/102
6,115,802 A * 9/2000 Tock et al. 711/216
6,141,749 A 10/2000 Cox et al.
6,147,976 A 11/2000 Shand et al.
6,182,228 B1 1/2001 Boden et al.
6,212,184 B1 * 4/2001 Venkataschary et al. 370/392
6,289,013 B1 9/2001 Lakshman et al.
6,301,669 B2 10/2001 Boden et al.
6,341,130 B1 1/2002 Lakshman et al.
7,031,314 B2 * 4/2006 Craig et al. 370/392
7,039,641 B2 * 5/2006 Woo 707/100

7,133,400 B1 * 11/2006 Henderson et al. 370/389

2001/0009193 A1 4/2001 Boden et al.

2002/0023080 A1 2/2002 Uga et al.

2002/0118682 A1 8/2002 Choe

2002/0152209 A1 10/2002 Merugu et al.

2002/0191605 A1 12/2002 Lunten et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0 742 524 A2 11/1996

(Continued)

OTHER PUBLICATIONS

Chao, Next Generation Routers, IEEE, pp. 1518-1558, Sep. 2002.*

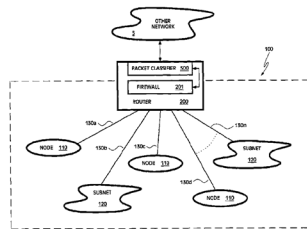
(Continued)

Primary Examiner—Frank Duong
(74) Attorney, Agent, or Firm—Caven & Aghevli LLC

(57) ABSTRACT

A packet classifier having a forest of hash tables data structure. The forest of hash tables data structure includes a number of hash tables, each hash table having a bit mask corresponding to an equivalent set of rules. Each hash table includes a number of entries, wherein an entry of a hash table may correspond to a rule. One or more of the hash tables may include a marker in one entry, wherein the marker identifies another one of the hash tables. The hash table identified by the marker is a descendant of the hash table in which the marker is placed.

61 Claims, 20 Drawing Sheets



Juniper Exhibit 1023, page 1

A packet classifier having a forest of hash tables data structure. The forest of hash tables data structure includes a number of hash tables, each hash table having a bit mask corresponding to an equivalent set of rules. Each hash table includes a number of entries, wherein an entry of a hash table may correspond to a rule. One or more of the hash tables may include a marker in one entry, wherein the marker identifies another one of the hash tables. The hash table identified by the marker is a descendant of the hash table in which the marker is placed.

Kumar: Focus on using Bit Masks to create “Search Keys”

(12) United States Patent Kumar et al.

(10) Patent No.: US 7,394,809 B2
(45) Date of Patent: Jul. 1, 2008

(54) METHOD AND APPARATUS FOR PACKET CLASSIFICATION USING A FOREST OF HASH TABLES DATA STRUCTURE

(75) Inventors: Alok Kumar, Santa Clara, CA (US);
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(73) Assignee: Intel Corporation, Santa Clara, CA (US)

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(65) Prior Publication Data
US 2004/0190526 A1 Sep. 30, 2004

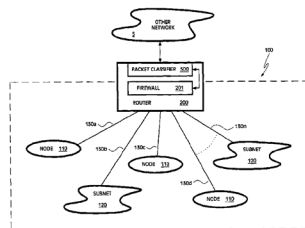
(51) Int. Cl.
H04L 12/28 (2006.01)

(52) U.S. Cl. 370/392
(58) Field of Classification Search None
See application file for complete search history.

(56) References Cited
U.S. PATENT DOCUMENTS

5,615,341 A * 3/1997 Agrawal et al. 705/10
5,920,900 A * 7/1999 Poole et al. 711/216
5,951,651 A * 9/1999 Lakshman et al.
5,995,971 A * 11/1999 Douceur et al. 707/102
6,115,802 A * 9/2000 Tock et al. 711/216
6,141,749 A 10/2000 Cox et al.
6,147,976 A 11/2000 Shand et al.
6,182,228 B1 1/2001 Boden et al.
6,212,184 B1 * 4/2001 Venkataschary et al. 370/392
6,289,013 B1 9/2001 Lakshman et al.
6,301,669 B2 10/2001 Boden et al.
6,341,130 B1 1/2002 Lakshman et al.
7,031,314 B2 * 4/2006 Craig et al. 370/392
7,039,641 B2 * 5/2006 Woo 707/100

61 Claims, 20 Drawing Sheets



Juniper Exhibit 1023, page 1

destination port are read. Assume, for example, that the source address is “192.128.0.0” and the destination port is “23”. As shown at block 1515, a hash table in the list of hash tables to search 1540 is selected. Hash Table A is selected. The bit mask 1010a of Hash Table A is applied (i.e., an “AND” operation) to the accessed header data to create a search key, which is shown at block 1520. The search key for Hash Table A is “11000000 00000000 00000000 00000000 00000000000010111”.

The search key is then compared against each entry of the selected hash table, which is illustrated at block 1525. If there

Kumar's Bit Masks Can Only Identify a Maximum Port Number

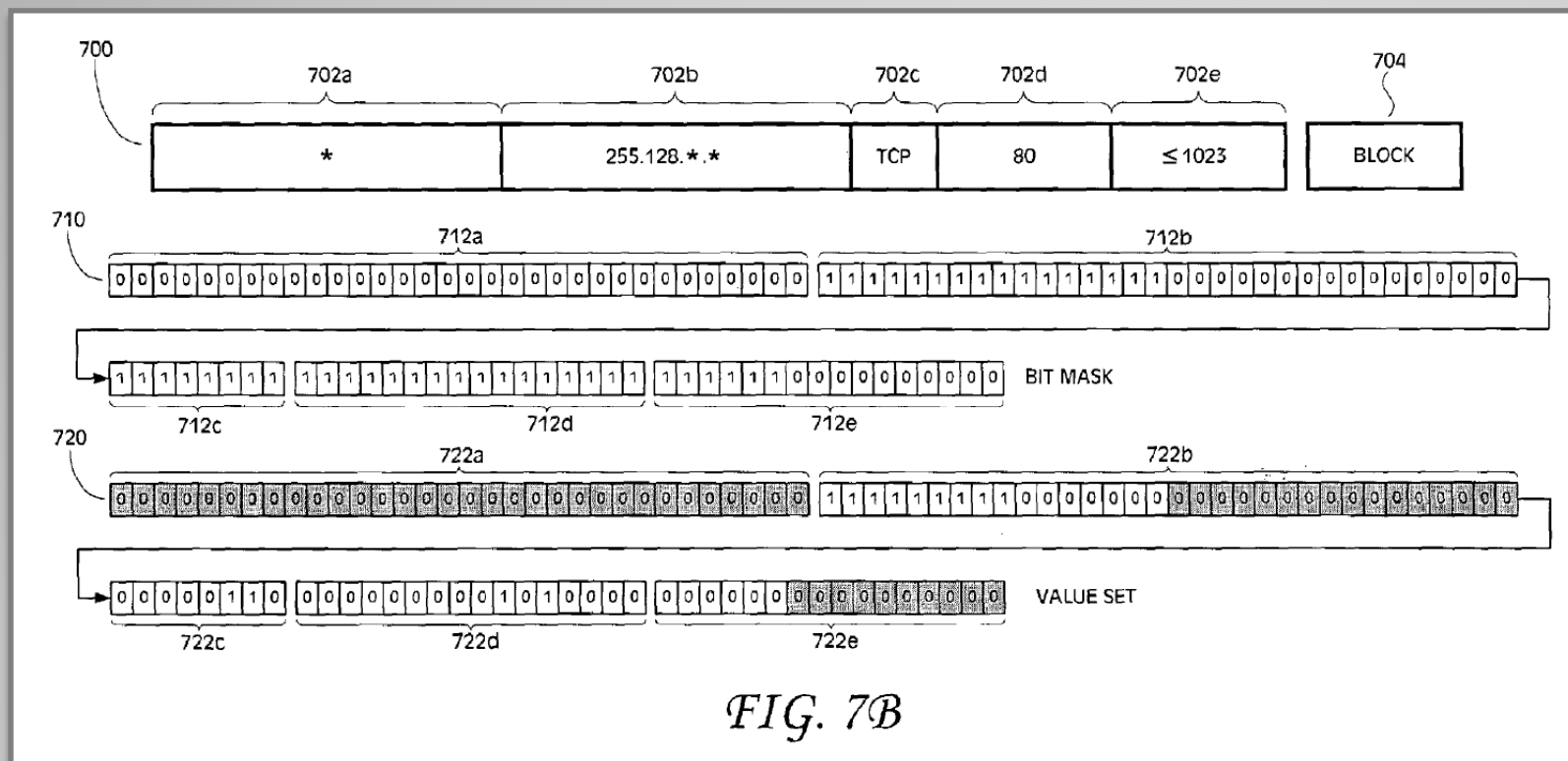


FIG. 7B

EX1023 Fig. 7B, 8:34-38

In FIG. 7B, the destination port specification of " ≤ 1023 " can be expressed in binary notation as "000000*****". However, not all ranges are amenable to expression by a single mask, and this concept is illustrated in FIGS. 7C through FIG. 7I. Referring to FIG. 7C, the rule 700 now

Binary AND functions cannot set lower limits

0-15

Mask: 1111 0000
15: 0000 1111 AND
Result: 0000 0000 (Pass)

Mask: 1111 0000
5: 0000 0101 AND
Result: 0000 0000 (Pass)

Mask: 1111 0000
18: 0001 0010 AND
Result: 0001 0000 (Fail)

16-31?

Mask: 1110 0001
16: 0001 0000 AND
Result: 0000 0000 (Pass)

Mask: 1110 0001
17: 0001 0001 AND
Result: 0000 0001 (Fail)

Mask: 1110 0001
19: 0001 0011 AND
Result: 0000 0001 (Fail)

Kumar's Masks Do Not Identify A Range >1023

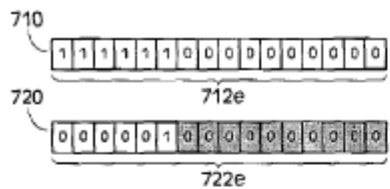


FIG. 7D

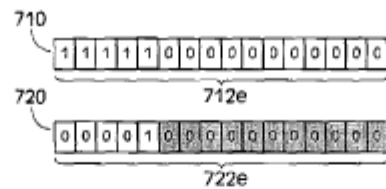


FIG. 7E

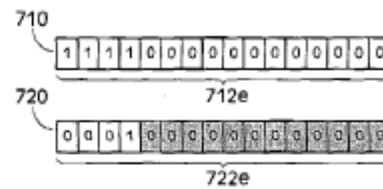


FIG. 7F

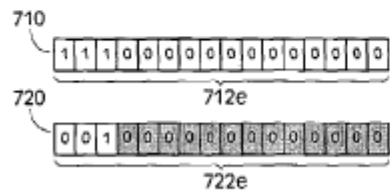


FIG. 7G

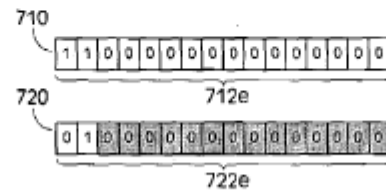


FIG. 7H

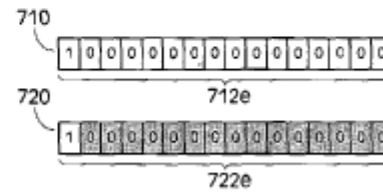
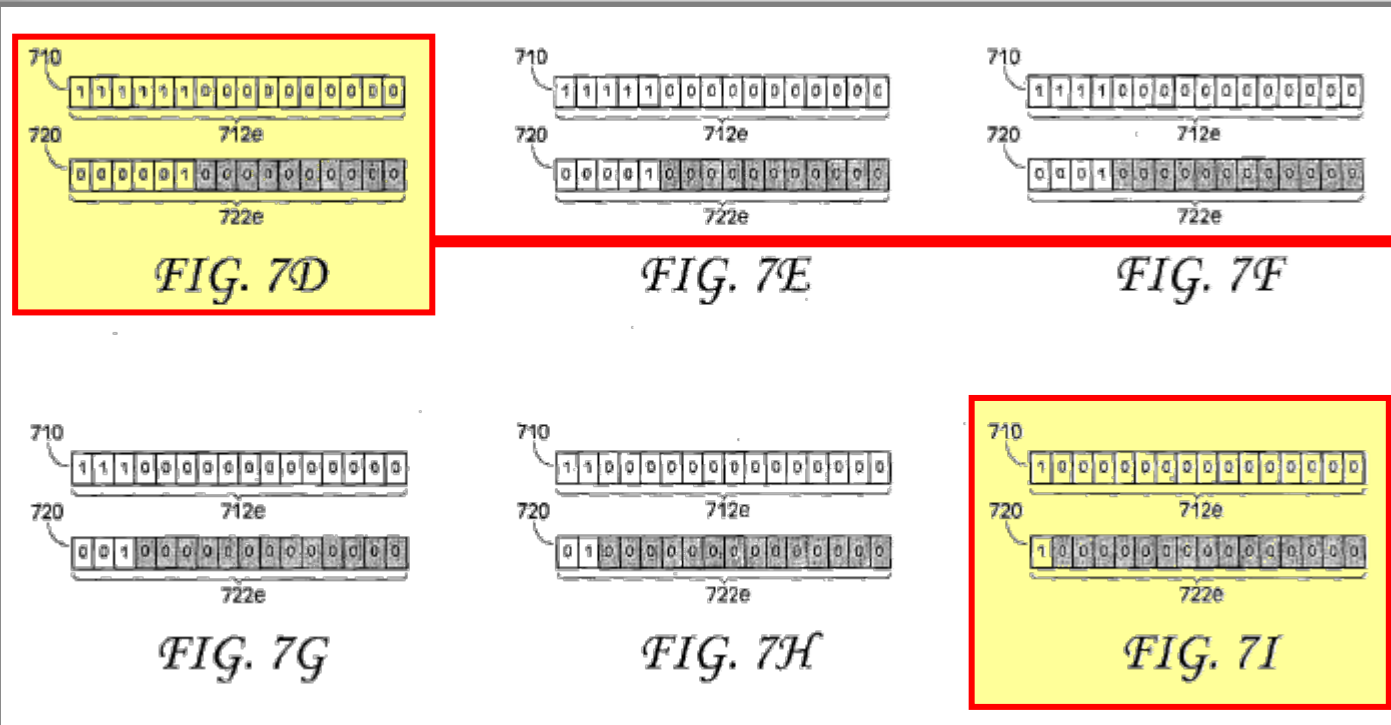


FIG. 7I

EX1023 Fig. 7B, 8:43-50

acter string or “prefix”. However, this expression can be broken down into a set of prefixes. More specifically, the range of “>1023” can be delineated by the following series of prefixes: “000001*****”, “00001*****”, “0001*****”, “001*****”, “01*****”, and “1*****”. Accordingly, the rule 700 specified in FIG. 7C can be expanded into six different rules, one for each of the six distinct prefixes comprising the range specification “>1023”. This is shown in FIGS. 7D through 7I, which illustrates the expansion of the

Kumar's Masks Do Not Identify A Range >1023



Mask: 1111 1100 0000 0000
1023: 0000 0011 1111 1111 AND
Result: 0000 0000 0000 0000(Pass)

Mask: 1000 0000 0000 0000
15: 0000 0000 0000 1111 AND
Result: 0000 0000 0000 0000(Pass)

EX1023 Fig. 7B, 8:43-50

Using AND functions, these masks allow any number below 32,768

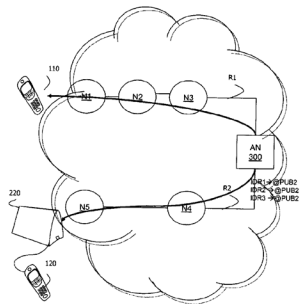
The '369 Patent

Key Points

- Grounds 2 & 4, Claims 1, 5, and 6
 - Fangman does not disclose routing a packet based on port ranges
- Grounds 3 & 5, Claims 1, 5, and 6
 - King does not disclose routing a packet based on port ranges
- All Grounds, All Claims
 - A POSITA would not modify any of the art to use bit masks
- **Ground 1, Claims 8 & 12,**
 - **Biswas does not disclose a routing identifier**

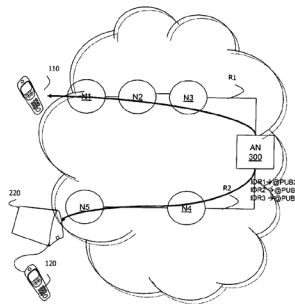
'369 Claims 8 and 12

	
US008693369B2	
(12) United States Patent Boucadair	(10) Patent No.: US 8,693,369 B2 (45) Date of Patent: Apr. 8, 2014
(54) METHOD OF ROUTING A DATA PACKET IN A NETWORK AND AN ASSOCIATED DEVICE	(56) References Cited U.S. PATENT DOCUMENTS
(75) Inventor: Mohamed Boucadair , Rennes (FR)	7,320,027 B1 1/2008 Chang et al. 370/252
(73) Assignee: Orange , Paris (FR)	7,751,339 B2 * 7/2010 Melton et al. 370/252
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 385 days.	7,894,451 B2 * 2/2011 Parker et al. 370/395,32
(21) Appl. No.: 12/935,040	7,986,670 B2 * 7/2011 Balbar et al. 370/331
(22) PCT Filed: Mar. 31, 2009	2002/0116523 A1 8/2002 Warner et al. 370/353
(86) PCT No.: PCT/FR2009/050548	2002/0141389 A1 10/2002 Fangman et al. 370/238
§ 371 (c)(1), (2), (4) Date: Sep. 28, 2010	2003/0053448 A1 * 3/2003 Craig et al. 370/238
(87) PCT Pub. No.: WO2009/125158	2003/0088694 A1 * 5/2003 Patel et al. 370/394
PCT Pub. Date: Oct. 15, 2009	2009/0279548 A1 * 11/2009 Davis et al. 370/394
(65) Prior Publication Data US 2011/0019588 A1 Jan. 27, 2011	2011/0067119 A1 * 3/2011 Baum 726/34
(30) Foreign Application Priority Data Mar. 31, 2008 (FR) 08 52108	* cited by examiner
(51) Int. Cl. H04L 12/28 (2006.01)	Primary Examiner — Hassan Kizou Assistant Examiner — Deepa Behur (74) Attorney, Agent, or Firm — Drinker Biddle & Reath LLP
(52) U.S. Cl. USPC 370/254; 370/351	ABSTRACT (57) A method of routing a data packet in a telecommunications network, said packet comprising a primary destination address and a destination port number. On reception of said packet, the following steps are executed: determining a port mask defining a range of port numbers to which the destination port number belongs; selecting an identifier of a destination piece of equipment of the packet from a plurality of equipment identifiers associated with said destination address on the basis of the port mask; and routing the packet to the destination piece of equipment on the basis of said identifier.
(58) Field of Classification Search USPC 370/254, 351 See application file for complete search history.	17 Claims, 9 Drawing Sheets



51

12. The configuration method according to claim 11, wherein, once an identifier of a routing device adapted to route a data packet comprising said primary address as the destination address to said piece of terminal equipment has been received, said method further comprises a step of sending the configuration data to said routing device.



Biswas: Assigning a Global Address and Global Port Range to a Host

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

(10) **Patent No.:** **US 8,019,889 B1**
(45) **Date of Patent:** **Sep. 13, 2011**

(54) **METHOD AND APPARATUS FOR MAKING
END-TO-END NETWORK ADDRESS
TRANSLATION (NAT) GLOBAL ADDRESS
AND PORT RANGES AWARE**

6,748,439 B1 * 6/2004 Monachello et al. 709/229
6,772,347 B1 * 8/2004 Xie et al. 726/11
6,870,845 B1 * 3/2005 Bellovin et al. 370/392

OTHER PUBLICATIONS

(75) Inventors: **Kaushik P. Biswas**, San Jose, CA (US);
Siva S. Jayasenan, Cupertino, CA (US);
Michael L. Sullenberger, San Jose, CA
(US); **Mark A. Denny**, San Jose, CA
(US)

P. Srisuresh, M. Holdrege, "IP Network Address Translator (NAT)
Terminology and Considerations", Lucent Technologies, Aug. 1999,
RFC 2663.
H. Levkowitz, "DHCP Option for Mobile IP Foreign Agents",
Internet Society, Feb. 22, 2002.

(73) Assignee: **Cisco Technology, Inc.**, San Jose, CA
(US)

* cited by examiner

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 2118 days.

Primary Examiner — Kyung-Hye Shin
(74) *Attorney, Agent, or Firm* — Weaver Austin Villeneuve
& Sampson LLP

(21) Appl. No.: **10/160,321**

(22) Filed: **May 31, 2002**

(51) **Int. Cl.** **G06F 15/16** (2006.01)

(52) **U.S. Cl.** **709/245; 709/229; 370/392**

(58) **Field of Classification Search** **709/245,**
709/229; 370/392

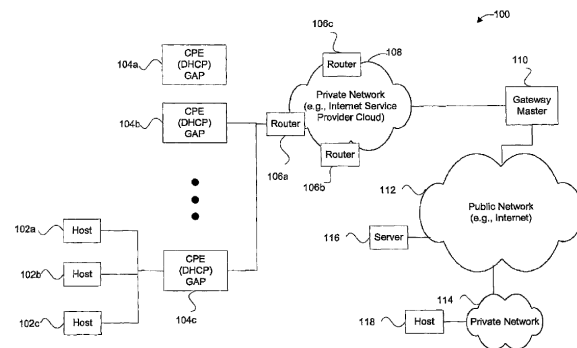
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,128,664 A * 10/2000 Yanagidate et al. 709/228
6,651,092 B1 * 11/2003 Muraoka 709/220

50 Claims, 12 Drawing Sheets



Accordingly, the present invention provides methods and apparatus for handling data having an embedded address (and port). In general terms, a host of a private network is operable to obtain from its corresponding edge router a global address (GA) and optionally a global port range (GPR). When the host then wishes to transmit data out of the private network, the obtained GA (and GPR) may then be used for an embedded address (and port) within data sent by the host to a public network. The obtained GA (and GPR) may also be used by the host to translate its own source address and port in its IP and/or TCP/UDP header if needed.

Petition: Biswas' Global Address is the "primary address" and "identifier of a routing device"

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

U.S. Patent No. 8,693,369

"Method of Routing a Data Packet in a Network and an Associated Device"

IPR2024-00175

PETITION FOR *INTER PARTES* REVIEW

(b) 7[a]

Biswas discloses limitation 7[a]: "assigning [e.g., via edge router 104] to said piece of terminal equipment [e.g., host 102a] a primary address [e.g., a global address] shared with a plurality of pieces of terminal equipment [e.g., other hosts 102b-c]." EX1003, ¶¶83-86.

6. Claim 8

Biswas further disclose the additional limitation of claim 8: "assigning to said piece of terminal equipment [e.g., host 102] an identifier of a routing device adapted to route a data packet [e.g., gateway master 110] comprising said primary address as the destination address to said piece of terminal equipment [e.g., the global address that is used by gateway master 110], and the configuration message [e.g., the DHCP reply 500] further comprising said routing device identifier." EX1003, ¶¶105-07.

Petition at 20, 27-28

Petition: Biswas' Global Address is the “primary address” and “identifier of a routing device”

UNITED STATES PATENT AND TRADEMARK OFFICE

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JUNIPER NETWORKS, INC.,
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v.

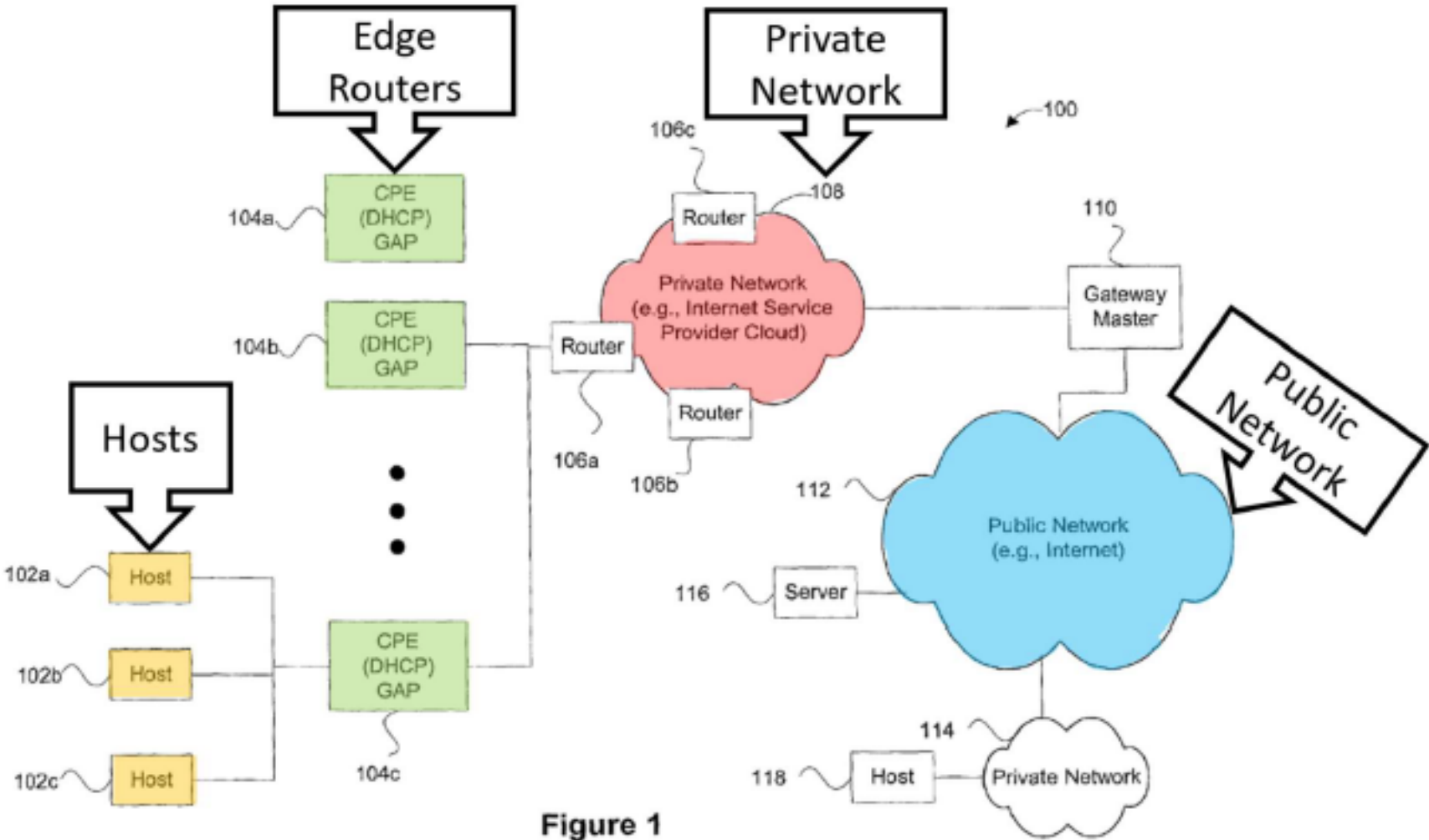
MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

U.S. Patent No. 8,693,369

“Method of Routing a Data Packet in a Network and an Associate

IPR2024-00175

PETITION FOR *INTER PARTES* REVIEW



Institution Decision: Claims 8 and 12 are not obvious

Trials@uspto.gov
571-272-7822

Paper 12
Entered: May 8, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

MONARCH NETWORKING SOLUTIONS LLC,
Patent Owner.

IPR2024-00175
Patent 8,693,369 B2

Before THU A. DANG, CHARLES J. BOUDREAU, and
NORMAN H. BEAMER, *Administrative Patent Judges*.

BEAMER, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

With that in mind, at this stage we cannot accept Petitioner's analysis regarding dependent claims 8 and 12. Petitioner assumes that the global address that is used by gateway master 110 corresponds to both the "primary address" and the "routing device identifier" referenced in claims 8 and 12, and that this global address of the gateway master is provided via the DHCP configuration. Pet. 28, 33–34. However, the only global address disclosed in Biswas that is provided to hosts is the global address of the edge routers.

Biswas: Global Address belongs to the CPE

Accordingly, the present invention provides methods and apparatus for handling data having an embedded address (and port). In general terms, a host of a private network is operable to obtain from its corresponding edge router a global address (GA) and optionally a global port range (GPR). When the host then wishes to transmit data out of the private network, the obtained GA (and GPR) may then be used for an embedded address (and port) within data sent by the host to a public network. The obtained GA (and GPR) may also be used by the host to translate its own source address and port in its IP and/or TCP/UDP header if needed.

EX1022 2:22-33

The edge routers **104** may be provisioned such that each edge router in the private network **108** has a unique and non-overlapping global address (GA) and global port range (GPR).

In the present invention, a host of a private network, such as each host **102** of network **108**, is operable to obtain from its corresponding edge router a global address (GA) and optionally an additional global port range (GPR) to thereafter be embedded within data sent by the host to a public network. In the illustrated embodiment, each host **102** of private network **108** is operable to obtain from its corresponding edge router **104** either (1) a global address for itself or (2) a GA and GPR for itself.

EX1022 6:37-49

Biswas: Global Address belongs to the CPE

Accordingly, the present invention provides methods and apparatus for handling data having an embedded address (and port). In general terms, a host of a private network is operable to obtain from its corresponding edge router a global address (GA) and optionally a global port range (GPR). When the host then wishes to transmit data out of the private network, the obtained GA (and GPR) may then be used for an embedded address (and port) within data sent by the host to a public network. The obtained GA (and GPR) may also be used by the host to translate its own source address and port in its IP and/or TCP/UDP header if needed.

EX1022 2:22-33

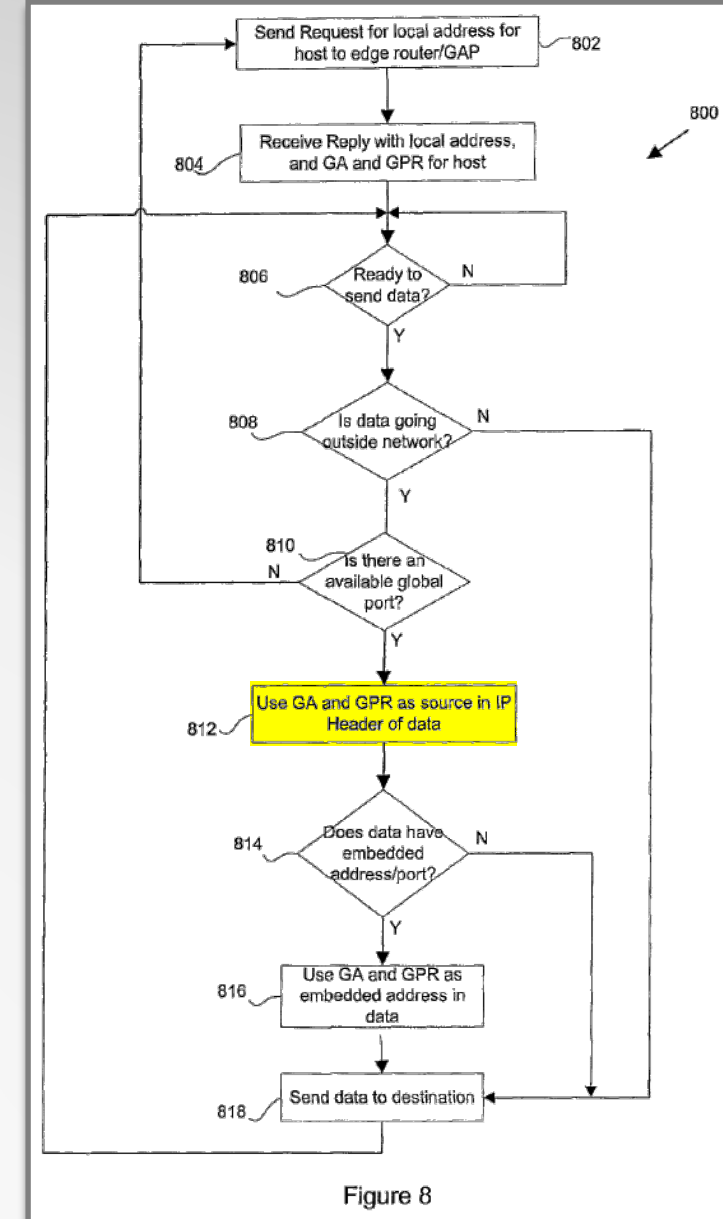


Figure 8

Biswas: Local Addresses Route Local Data

(12) United States Patent Biswas et al.

(10) Patent No.: US 8,019,889 B1
(45) Date of Patent: Sep. 13, 2011

(54) METHOD AND APPARATUS FOR MAKING END-HOST NETWORK ADDRESS TRANSLATION (NAT) GLOBAL ADDRESS AND PORT RANGES AWARE

6,748,439 B1 * 6/2004 Monachello et al. 709/229
6,772,347 B1 * 8/2004 Xie et al. 726/11
6,870,845 B1 * 3/2005 Bellevin et al. 370/392

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(75) Inventors: Kaushik P. Biswas, San Jose, CA (US);
Siva S. Jayaseelan, Cupertino, CA (US);
Michael L. Sullenberger, San Jose, CA
(US); Mark A. Denny, San Jose, CA
(US)

P. Sriuresh, M. Holdrege, "IP Network Address Translator (NAT)
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RFC 2663.

H. Levkowitz, "DHCP Option for Mobile IP Foreign Agents",
Internet Society, Feb. 22, 2002.

(73) Assignee: Cisco Technology, Inc., San Jose, CA
(US)

* cited by examiner

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 2118 days.

Primary Examiner — Kyung-Hye Shin

(74) Attorney, Agent, or Firm — Weaver Austin Villeneuve
& Sampson LLP

(21) Appl. No.: 10/160,321

(57)

ABSTRACT

(22) Filed: May 31, 2002

(51) Int. Cl.
G06F 15/16 (2006.01)

(52) U.S. Cl. 709/245; 709/229; 370/392

(58) Field of Classification Search 709/245,
709/229, 370/392

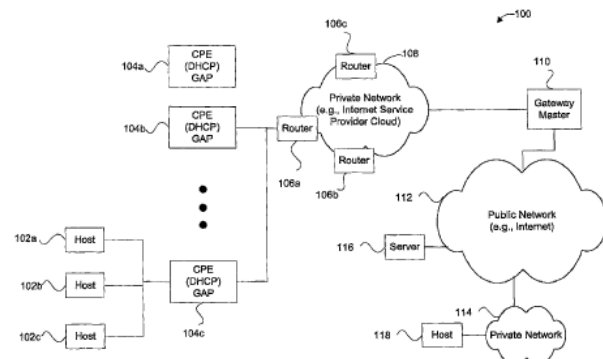
See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

6,128,664 A * 10/2000 Yangsate et al. 709/228
6,651,092 B1 * 11/2003 Muraoka 709/220

50 Claims, 12 Drawing Sheets



In the illustrated embodiment, Gateway Master 110 translates local addresses of data received from a private network 108 into global addresses of data being output from the Gateway Master 110 to public network 112, and vice versa. The Gateway Master 110 also translates global addresses of data received from public network 112 into local addresses of data being output from the Gateway Master 110 to private network 108, and vice versa. The Gateway Master 110 may also (or alternatively) translate ports, such as TCP (transmission control protocol) or UDP (User Datagram Protocol) ports, between the two realms. The Gateway Master 110 also maintains state information regarding each network address translation.

Nothing In Biswas Assigns Identifiers to Host 118

UNITED STATES PATENT AND TRADEMARK OFFICE

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U.S. Patent No. 8,693,369

"Method of Routing a Data Packet in a Network and an Associate

IPR2024-00175

PETITION FOR *INTER PARTES* REVIEW

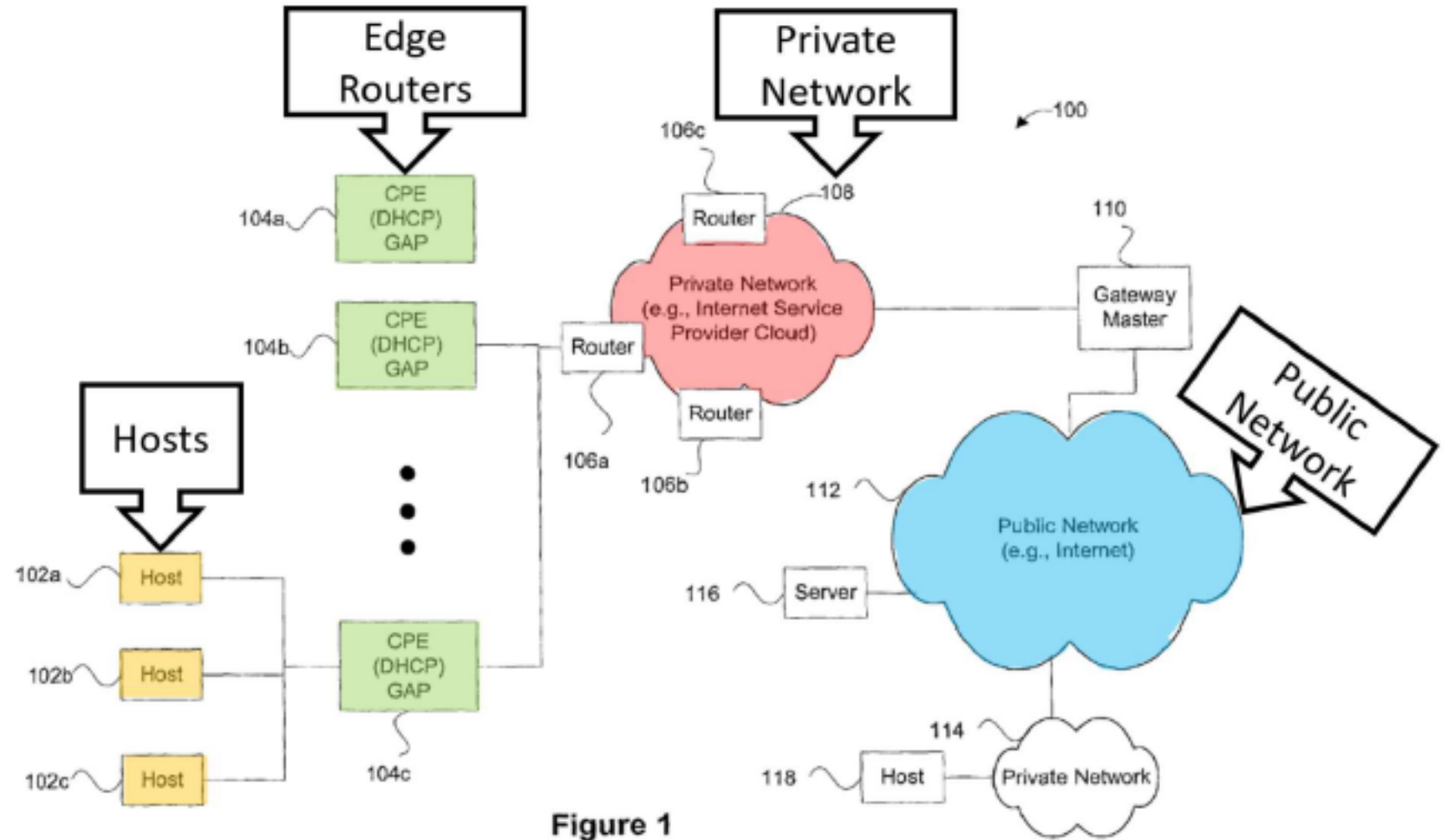


Figure 1

END