

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2024/0214344 A1 MALKIN et al.

(43) **Pub. Date:**

Jun. 27, 2024

(54) IPV4-IN-IPV6 RELAYING SYSTEMS AND METHODS TO PRESERVE IPV4 PUBLIC ADDRESSES

(71) Applicant: PLUME DESIGN, INC., Palo Alto, CA (US)

(72) Inventors: Yoseph MALKIN, San Jose, CA (US); Paul WHITE, Burlingame, CA (US); Matej ZEVNIK, Ljubljana (SI)

(21) Appl. No.: 18/596,074

(22) Filed: Mar. 5, 2024

Related U.S. Application Data

(63) Continuation of application No. 18/145,929, filed on Dec. 23, 2022, now Pat. No. 11,956,204.

Publication Classification

(51) **Int. Cl.**

H04L 61/2592 (2006.01)H04L 12/46 (2006.01)

H04L 61/251 (2006.01)H04L 69/22 (2006.01)

(52) U.S. Cl.

CPC H04L 61/2592 (2013.01); H04L 12/4633 (2013.01); H04L 61/251 (2013.01); H04L 69/22 (2013.01)

(57)ABSTRACT

A method, implemented in a router in a Communication Service Provider (CSP) network, includes connecting to a device via at least two connections where a first connection includes a first Wide Area Network (WAN) interface and a second connection includes a second WAN interface; receiving an encapsulated packet from one of the at least two connections where the encapsulated packet is destined for an Internet Protocol version 4 (IPv4) address on the Internet; and creating an IPv4 packet from the encapsulated packet by de-encapsulating the encapsulated packet and including an IPv4 public address in an IPv4 packet, wherein the IPv4 public address is associated with the router.

608

CONNECTING TO A DEVICE VIA AT LEAST TWO CONNECTIONS WHERE A 602 FIRST CONNECTION INCLUDES A FIRST WIDE AREA NETWORK (WAN) INTERFACE AND A SECOND CONNECTION INCLUDES A SECOND WAN INTERFACE RECEIVING AN ENCAPSULATED PACKET FROM ONE OF THE AT LEAST 604 TWO CONNECTIONS WHERE THE ENCAPSULATED PACKET IS DESTINED FOR AN INTERNET PROTOCOL VERSION 4 (IPV4) ADDRESS ON THE INTERNET CREATING AN IPV4 PACKET FROM THE ENCAPSULATED PACKET BY DE-ENCAPSULATING THE ENCAPSULATED PACKET AND INCLUDING AN 606 IPV4 PUBLIC ADDRESS IN AN IPV4 PACKET, WHEREIN THE IPV4 PUBLIC

TRANSMITTING THE IPV4 PACKET TO A DESTINATION ASSOCIATED WITH THE IPV4 ADDRESS

ADDRESS IS ASSOCIATED WITH THE ROUTER AND IS USED FOR INGRESS AND EGRESS PACKETS ASSOCIATED WITH THE AT LEAST TWO CONNECTIONS