CLAIMS

1. A packet forwarding method, applied to a gateway device in a layer three network, wherein there is a segment routing internet protocol version 6 (IPv6) (SRv6) tunnel between the gateway device and an access point (AP) connected to the gateway device, and the gateway device and different APs connected to the gateway device are allocated different locators; the method comprising:

when a first packet is received through the SRv6 tunnel, wherein a destination IP address in an IPv6 encapsulation header carried by the first packet comprises at least a locator and a function allocated to the gateway device,

performing IPv6 encapsulation header decapsulation on the first packet to obtain a second packet, wherein a destination media access control (MAC) address of the second packet is a MAC address of a layer three gateway interface associated with a virtual switch interface (VSI) instance bound to the function on the gateway device; and

forwarding the second packet based on a destination IP address of the second packet;

when a third packet is received from a network side, wherein a destination IPv6 address in an IPv6 encapsulation header carried by the third packet comprises at least a locator allocated to the gateway device,

performing IPv6 decapsulation on the third packet to obtain a fourth packet; and

forwarding the fourth packet based on a destination IP address of the fourth packet.

2. The method according to claim 1, wherein when the gateway device serves as a locator manager, a locator of the AP is allocated by the gateway device through steps comprising:

receiving a locator allocation request sent by the AP; and

allocating a corresponding locator to the AP based on the locator allocation request.

3. The method according to claim 2, wherein a user datagram protocol (UDP) connection for locator allocation is established between the gateway device and the AP, and the locator allocation request is received through the UDP connection;

wherein allocating the corresponding locator to the AP based on the locator allocation request comprises:

returning a locator allocation response to the AP through the UDP connection, wherein the locator allocation response carries at least a locator allocated for the AP;

receiving a designated locator allocation request returned by the AP based on the locator allocation response through the UDP connection, wherein the designated locator allocation request carries at least the locator carried by the locator allocation response; and

returning a locator allocation confirmation message to the AP through the UDP connection to confirm allocation of the locator to the AP.

4. The method according to claim 3, wherein after allocating the corresponding locator to the AP, the method further comprises:

when a locator occupation request sent by the AP is received through the UDP connection, if the AP is allowed to continue to occupy the allocated locator,

returning a locator occupation confirmation message to the AP through the UDP connection to confirm that the AP continues to occupy the allocated locator;

wherein the locator occupation request is for the AP requests whether to continue to occupy the allocated locator;

when the locator occupation request sent by the AP is not received within a preset time period,

releasing the allocated locator of the AP.

5. The method according to claim 1, further comprising:

after allocating, by the gateway device as a locator manager, a locator to the AP connected to the gateway device, generating a locator route pointing to the AP;

wherein a next hop of the locator route is an IPv6 address of an interface connected to the gateway device on the AP, and an outbound interface is a layer three interface on the gateway device for forwarding SRv6 services to the AP.

6. The method according to claim 1 or 5, wherein forwarding the second packet based on the destination IP address of the second packet comprises:

performing layer two header decapsulation on the second packet to obtain a fifth packet;

searching for an IP routing entry that matches a destination IP address of the fifth packet in an IP routing forwarding instance routing table associated with the layer three gateway interface;

if an outbound interface of the IP routing entry is an SRv6 tunnel port from the gateway device to a first AP,

forwarding a sixth packet based on an outbound interface in an obtained first locator route that matches a locator of the first AP, wherein the outbound interface in the first locator route is a layer three interface on the gateway device for forwarding SRv6 services to the first AP;

wherein the sixth packet is obtained by adding at least an IPv6 encapsulation header to the fifth packet; a destination IPv6 address in the IPv6 encapsulation header carried by the sixth packet comprises at least a locator and a function allocated to the first AP, and a source IPv6 address in the IPv6 encapsulation header carried by the sixth packet comprises at least a locator and a function allocated to the gateway device.

7. The method according to claim 6, wherein the function comprises at least a function type and a function operation instruction value;

wherein the function in the destination IPv6 address and the function in the source IPv6 address in the IPv6 encapsulation header carried by the sixth packet comprise a same function operation instruction value, which is a first service virtual local area network (VLAN) identifier (ID);

wherein the first service VLAN ID is a service VLAN ID to which the sixth packet belongs.

8. The method according to claim 1 or 5, wherein forwarding the fourth packet based on the destination IP address of the fourth packet comprises:

searching for an IP routing entry that matches the destination IP address of the fourth

packet in an IP routing forwarding instance routing table;

if an outbound interface of the IP routing entry is an SRv6 tunnel port from the gateway device to a second AP,

searching for a second locator route that matches a locator of the second AP in one or more obtained locator routes, and

forwarding a seventh packet through an outbound interface in the second locator route, wherein the outbound interface in the second locator route is a layer three interface on the gateway device for forwarding SRv6 services to the second AP;

wherein the seventh packet is obtained by adding at least an IPv6 encapsulation header to the fourth packet; a destination IPv6 address in the IPv6 encapsulation header carried by the seventh packet comprises at least a locator and a function allocated to the second AP, and a source IPv6 address in the IPv6 encapsulation header carried by the seventh packet comprises at least a locator and a function allocated to the gateway device.

9. The method according to claim 8, wherein the function comprises at least a function type and a function operation instruction value;

wherein the function in the destination IPv6 address and the function in the source IPv6 address in the IPv6 encapsulation header carried by the seventh packet comprise a same function operation instruction value, which is a second service virtual local area network (VLAN) identifier (ID);

wherein the second service VLAN ID is a service VLAN ID to which the seventh packet belongs.

10. The method according to claim 8, further comprising:

when an IP address of a terminal connected to any one of the APs is learned,

determining a function that matches the IP address of the terminal; and

reporting the function and the IP address of the terminal to the network side, so that a destination IPv6 address in an IPv6 encapsulation header carried by a packet sent from the network side to the terminal comprises at least the function;

wherein the function that matches the IP address of the terminal is for indicating IPv6 encapsulation and searching in an IP routing forwarding instance routing table that matches the IP address of the terminal and is for forwarding packets to the terminal;

wherein when the IP address of the terminal is internet protocol version 4 (IPv4), the IP routing forwarding instance routing table is an IPv4 virtual private network (VPN) routing table; when the IP address of the terminal is IPv6, the IP routing forwarding instance routing table is an IPv6 VPN routing table.

11. The method according to claim 1, further comprising:

when there is no MAC entry that matches a source MAC address of the second packet locally,

performing MAC learning on the second packet to obtain the MAC entry that matches the source MAC address of the second packet;

wherein the MAC entry comprises at least the source MAC address, a VSI instance, and outbound interface information of the second packet, wherein the VSI instance corresponds to a service virtual local area network (VLAN) identifier (ID) to which the second packet belongs.

12. A packet forwarding method, applied to an access point (AP) connected to a gateway device in a layer three network, wherein there is a segment routing internet protocol version 6 (IPv6) (SRv6) tunnel between the gateway device and the AP, and the AP, the gateway device and other APs connected to the gateway device are allocated different locators; the method comprising:

when a packet is to be forwarded to the gateway device,

carrying an IPv6 encapsulation header in the packet and forwarding a packet carrying the IPv6 encapsulation header through the SRv6 tunnel between the AP and the gateway device;

wherein a destination IP address in the IPv6 encapsulation header comprises at least a locator and a function allocated to the gateway device, and a source IP address in the IPv6 encapsulation header comprises at least a locator and a function allocated to the AP;

when a packet is received through the SRv6 tunnel between the AP and the gateway device,

performing IPv6 decapsulation on the received packet; and

performing packet forwarding based on a destination media access control (MAC) address of a decapsulated packet.

13. The method according to claim 12, wherein a function in a destination IPv6 address and a function in a source IPv6 address in the IPv6 encapsulation header are the same, both of which are a third service virtual local area network (VLAN) identifier (ID);

wherein the third service VLAN ID is a service VLAN ID to which the packet that is to be forwarded to the gateway device belongs.

14. A packet forwarding apparatus, applied to a gateway device in a layer three network, wherein there is a segment routing internet protocol version 6 (IPv6) (SRv6) tunnel between the gateway device and an access point (AP) connected to the gateway device, and the gateway device and different APs connected to the gateway device are allocated different locators; the apparatus comprising:

a packet receiving unit, configured to receive a first packet through the SRv6 tunnel or a third packet from a network side;

a packet processing unit, configured to,

when the first packet is received through the SRv6 tunnel, wherein a destination IP address in an IPv6 encapsulation header carried by the first packet comprises at least a locator and a function allocated to the gateway device,

perform IPv6 encapsulation header decapsulation on the first packet to obtain a second packet, wherein a destination media access control (MAC) address of the second packet is a MAC address of a layer three gateway interface associated with a virtual switch interface (VSI) instance bound to the function on the gateway device; and

forward the second packet based on a destination IP address of the second packet;

when the third packet is received from the network side, wherein a destination IPv6 address in an IPv6 encapsulation header carried by the third packet comprises at least a

locator allocated to the gateway device,

perform IPv6 decapsulation on the third packet to obtain a fourth packet; and

forward the fourth packet based on a destination IP address of the fourth packet.

15. The apparatus according to claim 14, wherein when the gateway device serves as a locator manager, the apparatus further comprises an allocating unit, configured to:

receive a locator allocation request sent by the AP; and

allocate a corresponding locator to the AP based on the locator allocation request.

16. The apparatus according to claim 15, wherein a user datagram protocol (UDP) connection for locator allocation is established between the gateway device and the AP, and the locator allocation request is received through the UDP connection;

wherein when allocating the corresponding locator to the AP based on the locator allocation request, the allocating unit is configured to:

return a locator allocation response to the AP through the UDP connection, wherein the locator allocation response carries at least a locator allocated for the AP;

receive a designated locator allocation request returned by the AP based on the locator allocation response through the UDP connection, wherein the designated locator allocation request carries at least the locator carried by the locator allocation response; and

return a locator allocation confirmation message to the AP through the UDP connection to confirm allocation of the locator to the AP.

17. The apparatus according to claim 16, wherein after allocating the corresponding locator to the AP, the allocating unit is further configured to:

when a locator occupation request sent by the AP is received through the UDP connection, if the AP is allowed to continue to occupy the allocated locator,

return a locator occupation confirmation message to the AP through the UDP connection to confirm that the AP continues to occupy the allocated locator;

wherein the locator occupation request is for the AP requests whether to continue to

occupy the allocated locator;

when the locator occupation request sent by the AP is not received within a preset time period,

release the allocated locator of the AP.

18. A packet forwarding apparatus, applied to an access point (AP) connected to a gateway device in a layer three network, wherein there is a segment routing internet protocol version 6 (IPv6) (SRv6) tunnel between the gateway device and the AP, and the AP, the gateway device and other APs connected to the gateway device are allocated different locators; the apparatus comprising:

a receiving unit, configured to receive packets through the SRv6 tunnel between the AP and the gateway device;

a forwarding unit, configured to,

when a packet is to be forwarded to the gateway device,

carry an IPv6 encapsulation header in the packet and forward a packet carrying the IPv6 encapsulation header through the SRv6 tunnel between the AP and the gateway device;

wherein a destination IP address in the IPv6 encapsulation header comprises at least a locator and a function allocated to the gateway device, and a source IP address in the IPv6 encapsulation header comprises at least a locator and a function allocated to the AP;

when a packet is received through the SRv6 tunnel between the AP and the gateway device,

perform IPv6 decapsulation on the received packet; and

perform packet forwarding based on a destination media access control (MAC) address of a decapsulated packet.

19. A machine-readable storage medium, storing computer instructions, wherein when the computer instructions are executed by a processor, the method according to any one of claims 1 to 11 is implemented.

20. A machine-readable storage medium, storing computer instructions, wherein when the computer instructions are executed by a processor, the method according to claim 12 or 13 is implemented.