



159159

DYNAMIC IPV6 CONFIGURATION METHOD FOR HOME GATEWAY

BACKGROUND OF THE INVENTION

Field of Invention

5 The present invention relates to the field of home gateway technologies, and in particular, relates to a dynamic IPv6 (Internet Protocol Version 6) configuration method for a home gateway.

Related Art

10 Home gateways are multi-service integrated access devices oriented to homes and small-sized enterprises users. By connecting a home gateway and an external network, a service providing platform oriented to a home is formed. The main function is to implement a conversion from an intelligent broadband access network to an informationized home network. At present, the global Internet IPv4 address pool is depleting, and research of a home gateway supporting IPv6 becomes imperative.

15 There are three ways to configure IPv6 for a home gateway:

First, through static configuration, information such as an IPv6 address of a gateway, a routing gateway, and an IPv6 domain name server (DNS: Domain Name System) is manually configured.

20 Second, through DHCPv6 (DHCP for IPv6, IPv6 dynamic host configuration protocol) (Dynamic Host Configuration Protocol) configuration; please refer to "RFC 3315: Dynamic Host Configuration Protocol for IPv6" for detailed content.

25 Third, through IPv6 PPPoE (Point-to-Point Protocol over Ethernet) configuration, the configuration of addresses at two ends of a PPP (Point-to-Point Protocol) link by a PPPoE server of the IPv4 differs from that by a PPPoE server of the IPv6. Addresses at two ends of a PPP link of the IPv4 are configured mainly through the IPCP (IP Control Protocol) of a PPP session phase. Addresses at two ends of a PPP link of the IPv6 are negotiated through the IPv6CP (IPv6 control protocol). According to "RFC 2472: IP Version 6 over PPP", the



G00002

IPv6CP negotiates 64-bit interface identifier (Interface Identifier) in a link negotiation phase, and generates a local link address, other than a global unicast address, at a pppx network interface. Therefore, only by further special processing, can communications between a home gateway user and an external network be implemented. A home gateway is
5 a hub for connecting an operator network and a user home network. How a home gateway user can communicate with an IPv6 network through a home gateway is an urgent technical problem to be solved in this field.

SUMMARY

The objective of the present invention is to provide a dynamic IPV6 configuration
10 method for a home gateway so as to overcome the defects in the aforementioned related art. By the method for IPv6 PPPoE dialing for a home gateway, through an operation of selecting an "obtain an address" option, the home gateway may acquire an IPv6 global unicast address of a network interface on a WAN side and further may access IPv6 network resources; and by simultaneously selecting options of "obtain an address" and "obtain a
15 prefix", a terminal user of the home gateway may acquire an IPv6 global unicast address and further may access IPv6 network resources.

The dynamic IPV6 configuration method for a home gateway provided in the present invention includes the following steps: A: establishing a wide area network connection in an Internet attribute routing mode and determining an IPV6 configuration manner for a
20 home gateway in a point-to-point protocol over Ethernet PPPoE dialing manner and according to a dynamic combination of PPPoE dialing options of "obtain an address" and "obtain a prefix"; and B: starting a dialing process, creating an interface for the dialing process, invoking, by the dialing process, an executable script ipv6-up, starting an IPv6 dynamic host configuration protocol DHCPv6 client in the gateway, generating different
25 configuration actions, and combining a stateful auto-configuration and a stateless auto-configuration, to implement the dynamic IPv6 configuration for the home gateway.

In the aforementioned technical solution, the dynamic combination of the PPPoE dialing options of "obtain an address" and "obtain a prefix" and flags thereof in step A include the following four situations:

(1) neither the "obtain an address" nor the "obtain a prefix" is selected, and the Flag value is 00;

(2) merely the "obtain a prefix" is selected, and the Flag value is 01;

(3) merely the "obtain an address" is selected, and the Flag value is 10; and

5 (4) both the "obtain an address" and the "obtain a prefix" are selected, and the Flag value is 11.

In the aforementioned technical solution, when the Flag value is 00, the DHCPv6 client requests a stateless DHCPv6 service, so that the home gateway acquires a domain name server address from a DHCPv6 server on the WAN side; and the DHCPv6 client starts a
10 DHCPv6 server side in the gateway to update configuration information of the domain name server address.

In the aforementioned technical solution, when the Flag value is 01, the DHCPv6 client initiates an identity association for prefix delegation IA_PD request, starts a router advertisement daemon, so that a PC on an LAN side of the home gateway acquires an IPv6
15 global unicast address through a stateless auto-configuration; and starts a DHCPv6 server side, so that a PC on an LAN of the home gateway acquires information of a domain name server address in a stateless DHCPv6 service manner in the stateful auto-configuration.

In the aforementioned technical solution, when the Flag value is 10, the DHCPv6 client initiates an identity association for non-temporary addresses IA_NA request, so that a
20 WAN side of the home gateway acquires information of an IPv6 global unicast address and a domain name server address through the stateful auto-configuration; and starts a DHCPv6 server side in the gateway to update configuration information of the domain name server address.

In the aforementioned technical solution, when the Flag value is 11, the DHCPv6 client
25 simultaneously initiates an IA_NA request and an IA_PD request, so that a WAN side of the home gateway acquires an IPv6 global unicast address and a domain name server address through the stateful auto-configuration; starts a router advertisement daemon, so that a PC on an LAN side of the home gateway acquires an IPv6 global unicast address

through the stateless auto-configuration; and starts a DHCPv6 server side in the gateway, so that a PC on an LAN side of the home gateway acquires information of a domain name server address in a stateless DHCPv6 service manner in the stateful auto-configuration.

5 In the aforementioned technical solution, the stateful auto-configuration is that: a corresponding network interface of the home gateway acquires an IPv6 global unicast address from a DHCPv6 server address pool on the WAN side and acquires a domain name server address from a DHCPv6 server on the WAN side.

10 In the aforementioned technical solution, the stateless DHCPv6 service manner in the stateful auto-configuration is that: the DHCPv6 server does not allocate an IPv6 address, but merely provides information of the domain name server address to the client.

In the aforementioned technical solution, the process of the stateless auto-configuration is that: a network interface obtains a global unicast address by combining a global address prefix advertised by routing and an interface identifier.

As compared with the prior art, the advantages of the present invention are as follows:

15 (1) With the method of IPv6 PPPoE dialing for a home gateway adopted in the present invention, through an operation of selecting an "obtain an address" option, the home gateway may acquire an IPv6 global unicast address of a network interface on a WAN side and further may access IPv6 network resources.

20 (2) By simultaneously selecting options of "obtain an address" and "obtain a prefix", a terminal user of the home gateway may acquire an IPv6 global unicast address and further may access IPv6 network resources.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a structural block diagram of a home gateway according to an embodiment of the present invention; and

25 FIG. 2 is a flow chart of a method according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is described below in detail with reference to the accompanying drawings and embodiments.

- As shown in FIG. 1, a home gateway is connected to an OLT (Optical Line Terminal).
- 5 An uplink port of the OLT is connected to a dialing server supporting the IPv6, a dynamic host configuration server, and a domain name server. A WEB server supporting the IPv6 is further needed.

- A WAN (Wide Area Network, wide area network) connection with an INTERNET (Internet) attribute routing mode is established in a gateway. This WAN connection may
- 10 forward data on an LAN (Local Area Network) side and data on a WAN side, to implement data exchange between the LAN side and the WAN side. It is selected that the configuration manner is a PPPoE dialing manner. This configuration manner has two options, respectively, "obtain an address" and "obtain a prefix". An IPV6 configuration manner of the home gateway is determined through a dynamic combination of the two
- 15 options. There are four situations of combination of the two options. Each combination adopts a different dynamic IPv6 configuration manner. The dynamic IPv6 configuration for the home gateway is implemented by combining a stateful auto-configuration and a stateless auto-configuration according to different IPv6 configuration manners for the home gateway.

- 20 As shown in FIG. 2, the flow for dynamic IPv6 configuration for a home gateway is as follows:

Step S1: Start a PPPoE dialing process pppd in a home gateway and create an interface for the dialing process.

Step S2: The dialing process pppd invokes an executable script ipv6-up.

- 25 Step S3: The executable script ipv6-up script determines whether a WAN connection carries an INTERNET attribute; if yes, turn to step S4; otherwise, exit.

Step S4: The executable script ipv6-up determines a currently selected configuration manner.

The four situations of the combination of the two options of the "obtain an address" and the "obtain a prefix" respectively are that:

when the obtaining an address is not selected and the obtaining a prefix is not selected, the Flag value is defined to be 00;

5 when the obtaining an address is not selected and the obtaining a prefix is selected, the Flag value is defined to be 01;

when the obtaining an address is selected and the obtaining a prefix is not selected, the Flag value is defined to be 10; and

10 when the obtaining an address is selected and the obtaining a prefix is selected, the Flag value is defined to be 11.

The difference among the four configurations lies in the difference of the options of the requests sent in the DHCPv6 client process. The DHCPv6 client requests a non-temporary address through an IA_NA (Identity Association for Non-temporary Addresses) option, requests a temporary address through an IA_TA (Identity Association for Temporary
15 Addresses) option, and make a request for allocating an address prefix through an IA_PD (Identity Association for Prefix Delegation) option.

The following describes the four configuration manners in detail.

i. When the Flag value is 00, step S5a and step S6b shown in FIG. 2 are executed.

20 Step S5a: The DHCPv6 client requests a stateless DHCPv6 service, that is, the dynamic host configuration server does not allocate an IPv6 address, but merely provides configuration information of a domain name server address.

Step S6b: Start a DHCPv6 server side in the gateway to update the configuration information of the domain name server address.

25 ii. When the Flag value is 01, the home gateway requests a prefix, and step S5b, step S6a, and step S6b shown in FIG. 2 are executed.

Step S5b: The DHCPv6 client initiates an IA_PD request and a prefix is acquired through the dynamic host configuration server on the WAN side, in the case that a prefix

allocated to the home gateway is less than or equal to 64 bits, and by default, a required number of bits of 0 is supplemented after the obtained address prefix to complete the 64 bits.

Step S6a: The DHCPv6 client starts an radvd (Router Advertisement Daemon); the
5 DHCPv6 client updates the acquired prefix to a configuration file of a radvd process; the radvd process sends the prefix, via an RA (Router Advertisement) packet, to a device on the LAN side of the home gateway; and at this time, the home gateway acts as a router, and it is necessary to update an radvd configuration in the home gateway, so that it supports address configuration in a stateless auto-configuration manner and a PC on the LAN side
10 acquires an IPv6 global unicast address through the stateless auto-configuration.

Step S6b: Start a DHCPv6 server side in the gateway to update the configuration information of the domain name server address; and the PC on the LAN side of the home gateway acquires information of the domain name server address in a stateless DHCPv6 service manner.

15 iii. When the Flag value is 10, the home gateway requests an address, and step S5c and step S6b shown in FIG. 2 are executed.

Step S5c: The executable script ipv6-up starts a DHCPv6 client; in this case, it is unnecessary to start the radvd; the DHCPv6 client requests an IA_NA manner, so that the WAN side of the home gateway acquires information of an IPv6 global unicast address and
20 a domain name server address through a stateful auto-configuration, where the address on the WAN side of the home gateway is from an IPv6 dynamic host configuration server address pool.

Step S6b: Start a DHCPv6 server side in the gateway to update the configuration information of the domain name server address.

25 iii. When the Flag value is 11, the home gateway simultaneously requests an address and a prefix, and step S5d, step S6a, and step S6b shown in FIG. 2 are executed.

Step S5d: The executable script ipv6-up starts a DHCPv6 client; the DHCPv6 client simultaneously requests an IA_NA manner and an IA_PD manner, so that the WAN side of

the home gateway acquires information of an IPv6 global unicast address and a domain name server address through a stateful auto-configuration, where the address on the WAN side of the home gateway is from a global unicast address configured in an IPv6 dynamic host configuration server address pool.

- 5 Step S6a: The DHCPv6 client starts an radvd; the DHCPv6 client updates the acquired prefix to a configuration file of a radvd process; the radvd process sends the prefix, via an RA packet, to a device on the LAN side of the home gateway; and at this time, the home gateway acts as a router, and it is necessary to update an radvd configuration in the home gateway, so that it supports address configuration in a stateless auto-configuration manner
10 and a PC on the LAN side acquires an IPv6 global unicast address through the stateless auto-configuration.

- Step S6b: Start a DHCPv6 server side in the gateway to update the configuration information of the domain name server address; and the PC on the LAN side of the home gateway acquires information of the domain name server address in a stateless DHCPv6
15 service manner in the stateful auto-configuration.

Specific operations and phenomena of the embodiments of the present invention are described as follows:

- An IPv6 dialing server and a dynamic host configuration server are started. An interface of the dynamic host configuration server is pppx. A router device needs to support
20 address configuration in a stateless auto-configuration manner. A terminal needs to acquire other configuration information apart from the address using the stateless DHCPv6. The domain name server address is one of the configuration information. An IPv6 PPPoE dialing connection in an INTERNET routing mode is established in the home gateway.

- (1) The configuration information of the IPv6 PPPoE dialing connection of the home
25 gateway is set as follows, the obtaining an address is not selected, the obtaining a prefix is not selected, and the device is rebooted. Through observation, the phenomena are that:

 After the home gateway starts a pppd process and creation of the pppx interface succeeds, the ipv6-up script starts running. The ipv6-up scrip starts a DHCPv6 client

process of the home gateway. The home gateway establishes two network interfaces, namely, a pppx network interface and a DHCPv6 network interface. The information of the domain name server address is acquired in a stateless DHCPv6 service manner.

5 (2) The configuration information of the IPv6 PPPoE dialing connection of the home gateway is set as follows, the obtaining an address is not selected, the obtaining a prefix is selected, and the device is rebooted. Through observation, the phenomena are that:

After the home gateway starts a pppd process and creation of the pppx interface succeeds, the ipv6-up script starts running. The ipv6-up script starts a DHCPv6 client process of the home gateway. After acquiring prefix information, the DHCPv6 client
10 process starts a router pass process radvd for the home gateway. Please refer to FIG. 2 for the detailed process. The DHCPv6 client process initiates an IA_PD request to acquire prefix information from the server end and updates it to a radvd configuration file. The radvd process sends the prefix information, via an RA packet, to a PC on the LAN side. The PC on the LAN side acquires an IPv6 global unicast address through a stateless
15 auto-configuration and acquires information of a domain name server address in a stateless DHCPv6 service manner.

(3) The configuration information of the IPv6 PPPoE dialing of the home gateway is set as follows, the obtaining an address is selected, the obtaining a prefix is not selected, the device is rebooted, and the router device does not need to support the stateless
20 auto-configuration. Through observation, the phenomena are that:

After the home gateway starts a pppd process and creation of the pppx interface succeeds, the ipv6-up script starts running. The ipv6-up script starts a DHCPv6 client process. The DHCPv6 client process initiates an IA_NA request to acquire information of an IPv6 global unicast address and a domain name server address from the dynamic host
25 configuration server address pool. At this time, the home gateway may be connected to an external network by means of PING.

(4) The configuration information of the IPv6 PPPoE dialing connection of the home gateway is set as follows, the obtaining an address is selected, the obtaining a prefix is

selected, and the gateway device is rebooted. Through observation, the phenomena are that:

After the home gateway starts a pppd process and creation of the pppx interface succeeds, the ipv6-up script starts running. The ipv6-up script starts a DHCPv6 client process. The DHCPv6 client process initiates requests including IA_NA and IA_PD
5 options. The home gateway simultaneously requests a prefix and an address. The home gateway acquires an IPv6 global unicast address to the pppx interface on the WAN side through a stateful auto-configuration. The DHCPv6 client process updates prefix information acquired from the dynamic host configuration server to a radvd configuration file of the gateway and initiates a radvd process in the home gateway. The radvd process
10 sends the prefix, via an RA packet, to a PC on an LAN side of the home gateway. The PC on the LAN side acquires an IPv6 global unicast address through a stateless auto-configuration and acquires information of a domain name server address through a DHCPv6 server of the gateway. The gateway may be connected to an external network by means of PING. Meanwhile, the PC on the LAN side may be connected to an external
15 network by means of PING.

Obviously, a person skilled in the art could make various modifications or transformations to the present invention without departing from the spirit and scope of the present invention. In this way, the present invention is also intended to include these modifications and transformations, as long as these modifications and transformations fall
20 within the scope of the claims and the equivalent technologies of the present invention.

The contents that are not described in detail in the description fall within the prior art that is well known to a person skilled in the art.

CLAIMS

What is claimed is:

1. A dynamic IPv6 configuration method for a home gateway, comprising the following steps:

5 A: establishing a wide area network connection in an Internet attribute routing mode and determining an IPv6 configuration manner for the home gateway in a point-to-point protocol over Ethernet PPPoE dialing manner and according to a dynamic combination of PPPoE dialing options of "obtain an address" and "obtain a prefix"; and

10 B: starting a dialing process, creating an interface for the dialing process, invoking, by the dialing process, an executable script ipv6-up, starting an IPv6 dynamic host configuration protocol DHCPv6 client in the gateway, generating different configuration actions, and combining a stateful auto-configuration and a stateless auto-configuration, to implement the dynamic IPv6 configuration for the home gateway.

15 2. The dynamic IPv6 configuration method for a home gateway according to claim 1, wherein the dynamic combination of PPPoE dialing options of "obtain an address" and "obtain a prefix" in step A and flags thereof comprise the following four situations:

(1) neither the "obtain an address" nor the "obtain a prefix" is selected, and the Flag value is 00;

(2) merely the "obtain a prefix" is selected, and the Flag value is 01;

20 (3) merely the "obtain an address" is selected, and the Flag value is 10; and

(4) both the "obtain an address" and the "obtain a prefix" are selected, and the Flag value is 11.

25 3. The dynamic IPv6 configuration method for a home gateway according to claim 2, wherein when the Flag value is 00, the DHCPv6 client requests a stateless DHCPv6 service, and the home gateway acquires configuration information of a domain name server address apart from the address in a stateless DHCPv6 manner.

4. The dynamic IPv6 configuration method for a home gateway according to claim 2,

wherein when the Flag value is 01, the DHCPv6 client initiates an identity association for prefix delegation IA_PD request, starts a router advertisement daemon, so that a PC on an LAN side of the home gateway acquires an IPv6 global unicast address through the stateless auto-configuration, and acquires information of a domain name server address in a
5 stateless DHCPv6 service manner in the stateful auto-configuration.

5. The dynamic IPv6 configuration method for a home gateway according to claim 2, wherein when the Flag value is 10, the DHCPv6 client initiates an identity association for non-temporary addresses IA_NA request, so that a WAN side of the home gateway acquires information of an IPv6 global unicast address and a domain name server address
10 through the stateful auto-configuration; and starts a DHCPv6 server side in the gateway to update configuration information of the domain name server address.

6. The dynamic IPv6 configuration method for a home gateway according to claim 2, wherein when the Flag value is 11, the DHCPv6 client simultaneously initiates an IA_NA request and an IA_PD request, so that a WAN side of the home gateway acquires
15 information of an IPv6 global unicast address and a domain name server address through a stateful auto-configuration; starts a router advertisement daemon and starts a DHCPv6 server side in the gateway, so that a PC on an LAN side of the home gateway acquires an IPv6 global unicast address through the stateless auto-configuration and acquires information of a domain name server address in a stateless DHCPv6 service manner in the
20 stateful auto-configuration.

7. The dynamic IPv6 configuration method for a home gateway according to claim 5 or 6, wherein the stateful auto-configuration is that: the information of the IPv6 global unicast address and the domain name server address is acquired from a DHCPv6 server address pool on the WAN side and the IPv6 address is allocated to a corresponding network
25 interface of the home gateway.

8. The dynamic IPv6 configuration method for a home gateway according to any one of claims 3 to 6, wherein the stateless DHCPv6 service manner in the stateful auto-configuration is that: the IPv6 dynamic host configuration server does not allocate an IPv6 address, but merely provides information of the domain name server address to the

client.

9. The dynamic IPv6 configuration method for a home gateway according to any one of claims 3 to 6, wherein the process of the stateless auto-configuration is that: a network interface obtains a global unicast address by combining a global address prefix advertised
5 by routing and an interface identifier.