

Network Working Group
Internet-Draft
Intended status: Standards Track
Expires: September 5, 2014

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March 4, 2014

Radius Extension for Lightweight 4over6
draft-sun-softwire-lw4over6-radext-01

Abstract

lightweight 4over6(lw4over6) [[I-D.ietf-softwire-lw4over6](#)] is an extension to DS-Lite in which the amount of state maintained in lwAFTR has been reduced to per-subscriber-level. The lwB4 needs to be provisioned with the public IPv4 address and port set it is allowed to use. The DHCPv4 over DHCPv6 Transport [[I.D-ietf-dhc-dhcpv4-over-dhcpv6](#)] and Dynamic Host Configuration Protocol (DHCP) Option for Port Set [[I.D-sun-dhc-port-set-option](#)] can be used for lwB4 to provision with the public IPv4 address and port set.

However, in many networks, the configuration information may be stored in Authentication Authorization and Accounting (AAA) servers while user configuration is mainly from Broadband Network Gateway (BNG). This document defines a Remote Authentication Dial In User Service (RADIUS) attribute that carries lightweight 4over6 configuration information from AAA server to BNG.

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[1.](#) Introduction

Lightweight 4over6 (lw4over6) [[I-D.ietf-softwire-lw4over6](#)] defines a model for providing IPv4 access over an IPv6 network in which the Network Address Translation (NAT) function is performed by the Customer-Premises Equipment (CPE) instead of being centralized on a Carrier-Grade NAT (CGN). Lightweight 4over6 features keeping per-subscriber binding state in the service provider's network. This per-subscriber binding state is assigned by the provisioning system and should be synchronized between lwAFTRs. In lw4over6, there are multiple mechanisms to provision an lwB4 with the binding state,

including [I-D.ietf-dhc-dhcpv4-over-dhcpv6], [I-D.ietf-softwire-map-dhcp] , or [[I-D.ietf-pcp-port-set](#)], etc.

In many networks, user configuration information may be managed by AAA (Authentication, Authorization, and Accounting) servers. Current AAA servers communicate using the Remote Authentication Dial In User Service (RADIUS) [[RFC2865](#)] protocol. In a fixed line broadband network, the Broadband Network Gateways (BNGs) act as the access gateway of users. For lw4over6 case, the BNGs are assumed to embed a DHCPv4-over-DHCPv6 server function which allows them to locally handle any DHCPv4-over-DHCPv6 requests issued by hosts. The operators may per-configure subscriber's binding state in AAA server which then passes the information to a BNG and in turn populates the mapping of the subscribe.

This document defines a new RADIUS attribute that can be used in lightweight 4over6 to carry subscriber's binding state.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

Terminology defined in [[I-D.ietf-softwire-lw4over6](#)] is used extensively in this document.

3. Lightweight 4over6 configuration process with RADIUS

The below Figure 1 illustrates how the RADIUS protocol and DHCPv4-over-DHCPv6 cooperate to provide lwB4 with the binding state.

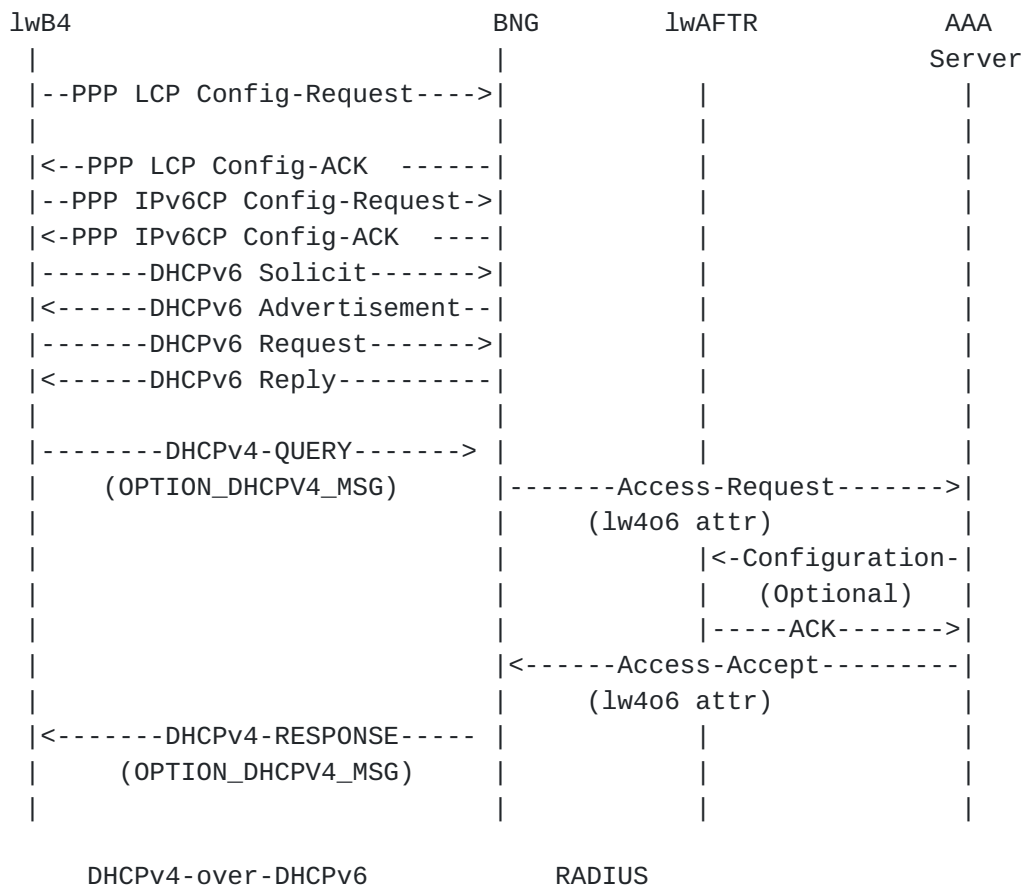


Figure 1: Lightweight 4over6 configuration process with RADIUS case 1

BNGs act as a client of RADIUS and as a Unified server. The lwB4 will firstly get the IPv6 address via DHCPv6 process. It then initiates a DHCPv4-QUERY message with OPTION_DHCPV4_MSG Option. Since the lwB4 has known the address of the Unified server in advance, it is recommended to send the DHCPv4-QUERY message using unicast address. When receiving the DHCPv4-QUERY from lwB4, the BNG SHOULD intercept the subscriber's IPv6 address and stored locally. Then, the BNG SHOULD initiate a RADIUS Access-Request message, in which the User-Name attribute (1) SHOULD be filled by the lwB4 MAC address, to the RADIUS server, the User-password attribute (2) SHOULD be filled by the shared lw4over6 password that has been preconfigured on the DHCPv6 server to get lw4over6 attribute. The IPv6 address in lw4o6 attribute should be filled by the subscriber's IPv6 address. The AAA server will then determine the IPv4 address and Port Set for the subscriber.

The subscriber's binding state should be synchronized between AAA server and lwAFTR. If the bindings are pre-configured statically in both AAA server and lwAFTR, the AAA server does not need to configure lwAFTR anymore. Otherwise, if the bindings are locally created in

AAA server on-demand, it should inform the lwAFTR with the subscriber's binding state using [I-D.zhou-dime-4over6-provisioning] or COA requests.

Figure 2 illustrates how the RADIUS protocol and DHCPv6 cooperate to provide lwB4 and lwAFTR with tunnel configuration information.

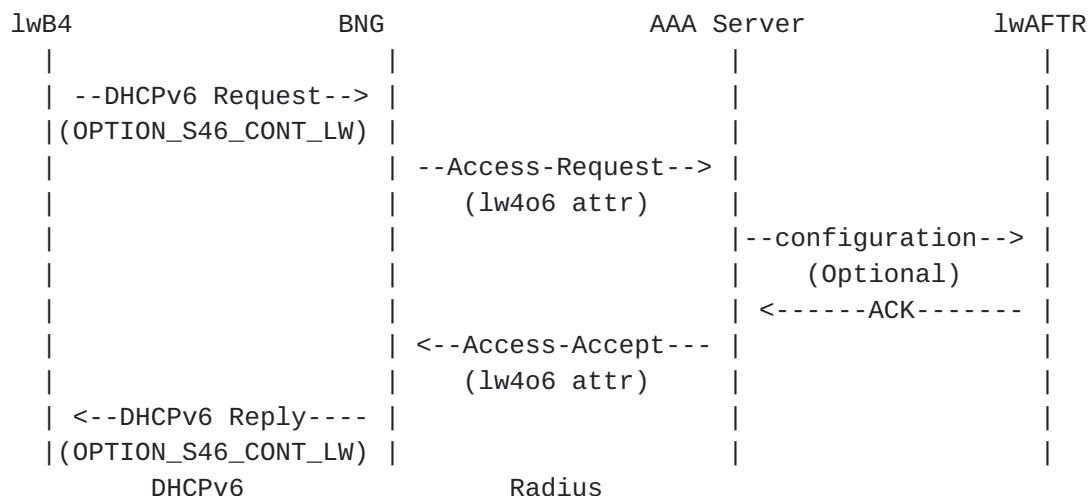


Figure 2: Lightweight 4over6 configuration process with RADIUS case 2

BNGs act as a RADIUS client and as a DHCPv6 server. Before the tunnel establishes, lwB4 MAY initiate a DHCPv6 Solicit message that includes an Option Request option[RFC3315] with OPTION_S46_CONT_LW option defined in [I-D.ietf-software-map-dhcp]. When BNG receives the SOLICIT, it SHOULD initiate radius Access-Request message, in which the User-Name attribute (1) SHOULD be filled by the lwB4 MAC address, to the RADIUS server, the User-password attribute (2) SHOULD be filled by the shared lw4over6 password that has been preconfigured on the DHCPv6 server to get lw4over6 attribute.

If the authentication request is approved by the AAA server, AAA server will determine the IPv6 address, IPv4 address and Port Set for the subscriber. The subscriber's binding state should be synchronized between AAA server and lwAFTR. If the bindings are pre-configured statically in both AAA server and lwAFTR, the AAA server does not need to configure lwAFTR anymore. Otherwise, if the bindings are locally created in AAA server on-demand, it should inform the lwAFTR as mentioned above.

Similarly, BNGs can act as a RADIUS client and as a PCP server in case an lwB4 runs a PCP client (as depicted in Figure 3).

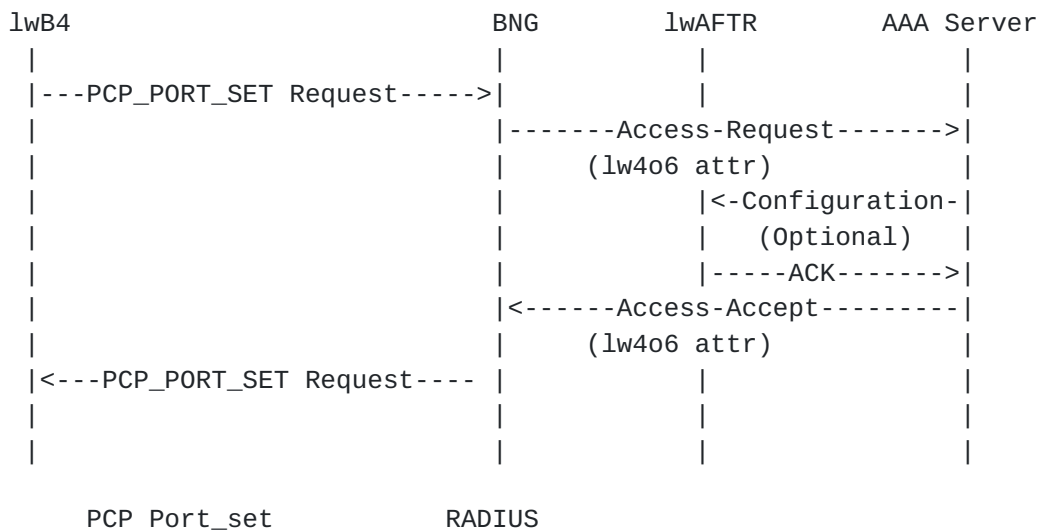


Figure 3: Lightweight 4over6 configuration process with RADIUS case 3

In the above-mentioned scenarios, Message-Authenticator (type 80) [RFC2865] SHOULD be used to protect both Access-Request and Access-Accept messages.

After receiving the lw4over6-binding attribute in the initial Access-Accept, the BNG SHOULD store the received lw4over6 configuration parameters locally. When the lw4over6 CE sends a DHCP or PCP Request message to request an extension of the lifetime for the assigned address, the BNG does not have to initiate a new Access-Request towards the AAA server to request the lw4o6 binding state. The BNG could retrieve the previously stored lw4o6 configuration parameters and use them in its reply. The BNG will then inform the AAA server with updated lifetime.

If the BNG does not receive the lw4over6-binding attribute in the Access-Accept or if the BNG receives an Access-Reject, the tunnel cannot be established.

4. Attributes

This section defines the lw4o6_binding attribute that is used in both above-mentioned scenarios. The attribute design follows [RFC6158] and refers to [RFC6929].

4.1. lw4o6_binding Attribute

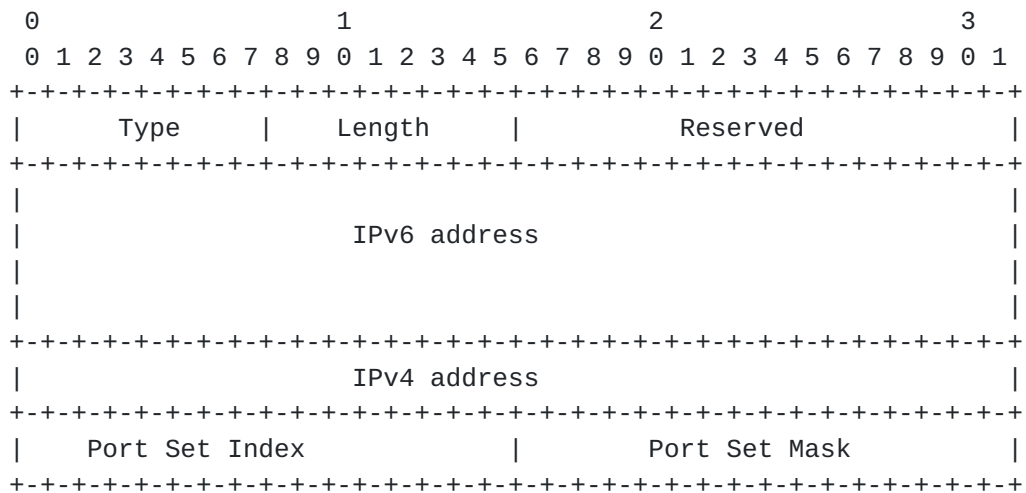
The lw4o6_binding RADIUS attribute contains the subscriber's binding information including IPv6 address, IPv4 address and the port-set. The BNG SHALL use the binding entry returned in the RADIUS lw4o6_binding attribute to populate the requests.

If the BNG includes the `lw4o6_binding` attribute, but the AAA server does not recognize it, this attribute **MUST** be ignored by the AAA server.

If the BNG does not receive the `lw4o6_binding` attribute in the Access-Accept message and there is the unified server in BNG is not configured to allocate the port-set by itself, the unified **SHOULD** not response and the tunnel can not be established.

When the Access-Request message is triggered by a DHCP Rebind message, if the binding attribute received in the Access-Accept message is different from the currently used one for that session, the BNG **MUST** force the lwB4 to re-establish the tunnel using the new binding information received in the Access-Accept message.

The `lw4o6_binding` Attribute is structured as follows:



Type

TBD

Length

28

Port Set Index:

Port Set Index identifies a set of ports assigned to a device. The first k bits on the left of the 2-octet field is the Port Set Index value, with the rest of the field right padding zeros.

Port Set Mask:

Port Set Mask indicates the position of the bits used to build the mask. The first k bits on the left is padding ones while the remained (16-k) bits of the 2-octet field on the right is padding zeros.

IPv4 address

The translated IPv4 address for a subscriber.

IPv6 address

The IPv6 address for a subscriber.

Figure 4: Lightweight 4over6 Attribute

5. Table of attributes

The following table provides a guide to which attributes may be found in which kinds of packets, and in what quantity.

Request	Accept	Reject	Challenge	Accounting	#	Attribute
				Request		
0-1	0-1	0	0	0-1	TBD1	lw4o6-binding
0-1	0-1	0	0	0-1	1	User-Name
0-1	0	0	0	0	2	User-Password
0-1	0-1	0	0	0-1	6	Service-Type
0-1	0-1	0-1	0-1	0-1	80	Message-Authenticator

The following table defines the meaning of the above table entries.

0	This attribute MUST NOT be present in packet.
0+	Zero or more instances of this attribute MAY be present in packet.
0-1	Zero or one instance of this attribute MAY be present in packet.
1	Exactly one instance of this attribute MUST be present in packet.

Figure 5: Lightweight 4over6 Attribute Table

6. Security Considerations

TO BE COMPLETED

7. IANA Considerations

This document has no IANA actions.

8. Acknowledgements

The authors would like to thank the following individuals who have participated in the drafting, review, and discussion of this memo: TO BE COMPLETED

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