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IPv6 Support

L2 BRAS (BNG) supports allocating of stateful DHCPv6 IPv6 addresses. In this mode, IPv6-address is allocated to the subscriber with DHCPv6. Automated allocation of IPv6-addresses (SLAAC/stateless DHCPv6) is not supported.

The concept of the work scheme looks like this:

1. subscriber's CPE searches for the IPv6-router using ICMPv6. DPI announces itself as an IPv6-router. It specifies that DHCPv6 is needed in order to receive an IPv6-address;
2. CPE sends a DHCPv6-request to obtain an IPv6-address;
3. DPI intercepts all DHCPv6 subscriber requests and processes them, in fact it is acting as a DHCPv6 server. If the DPI has no information on such subscriber or the session has expired, DHCPv6-request is transferred to Radius with PCRF;
4. PCRF receives a response from Radius. Among other parameters, it contains subscriber's IPv6-prefix and PD-prefix (prefix delegation) if needed. Then the response is transferred back to DPI;
5. Having the data from PCRF, DPI sends a DHCPv6-response to the subscriber. DPI allocates one IPv6 address from the IPv6 prefix given to the subscriber, while the PD-prefix is transmitted to the subscriber completely. Despite that only one address is allocated from an IPv6-prefix, all IPv6 addresses of this prefix belong to this subscriber. Actually, the subscriber can request several IPv6-addresses, – they will all be issued from the IPv6 prefix provided.

It should be specially noted that the Radius should allocate a fixed-length IPv6 prefix to the subscriber. Prefix length is set by parameter ipv6_subnetwork, /64 is the default value. PD-prefix length also has to be equal `ipv6_subnetwork`.

If the subscriber has both IPv6- and PD-prefix, then such subscriber must be marked as multi-bind. The reason is that such subscriber holds ***two*** IPv6-prefixes; Radius response should contain attribute `VasExperts-Multi-IP-User=1`.

Enabling IPv6 BRAS/BNG

IPv6 BRAS/BNG mode is enabled automatically, if there is a setting in *fastdpi.conf*

```
ipv6=1
bras_enable=1
```

You can disable IPv6 BRAS by setting in *fastdpi.conf*:

```
bras_ipv6=0
```

The bras_ipv6 parameter can be turned off (`bras_ipv6=0`) without DPI restart.

DHCPv6 request processing mode is enabled since IPv6 BRAS is enabled. You can disable DHCPv6 and ICMPv6 Router Solicitation by setting in *fastdpi.conf*

```
bras_dhcp6_mode=0
```

Additionally you can set the following parameters in *fastdpi.conf*:

♦ `bras_ipv6_link_local` - link-local DPI address (from FE80::/10). If this parameter is not set, link-local address is computed automatically from bras_arp_mac. DPI always has a link-local address.

♦ `bras_ipv6_address` - sets the global DPI IPv6-address. For example, the global address can be useful for pinging DPI from the subscriber. If this parameter is not set, DPI does not have a global IPv6-address.

♦ ICMPv6 Options

♦ DHCPv6 Options

Radius-Server Intergation

Example of an Access-Request for allocating IPv6 prefixes to the subscriber:

```
Packet-Type = Access-Request
User-Name = "1106.106"
Calling-Station-Id = "a0:b1:c2:d3:00:6a"
Acct-Session-Id = "03119DF4AAB8E41D"
NAS-Identifier = "FastPCRF"
NAS-Port-Type = Virtual
NAS-Port-Id = "1106/106"
NAS-IP-Address = 188.227.73.40
VasExperts-Service-Type = DHCPv6
VasExperts-DHCPv6-Request = Solicit
VasExperts-DHCPv6-Delegated = 1
VasExperts-DHCP-ClientId = 0x00010001237d47fca0b1c2d3006a
```

In this example, QinQ is a subscriber's ID, request is initiated by Solicit DHCPv6 packet (`VasExperts-Service-Type = DHCPv6`, `VasExperts-DHCPv6-Request = Solicit`), the subscriber request includes PD-prefix (`VasExperts-DHCPv6-Delegated = 1`).

CPE can request an IPv6-address and a PD-prefix either in one or separate DHCPv6-requests. That is why you should not rely on the `VasExperts-DHCPv6-Delegated` attribute value: even if the subscriber does not request a PD-prefix, the Radius can allocate one. The DPI will save it, and if the CPE will request it later, DPI will return the previously allocated PD

Example of response:

```
Packet-Type = Access-Accept
User-Name="abonent-106"
VasExperts-Multi-IP-User = 1
Framed-IPv6-Prefix = 2001:cafe:32:106::/64
```

```
Delegated-IPv6-Prefix = 2001:de1e:32:106::/64
DNS-Server-IPv6-Address = 2001:feac::1
DNS-Server-IPv6-Address = 2001:feac::2
Session-Timeout = 7200
Idle-Timeout = 600
VasExperts-Policing-Profile = "rate_100M"
VasExperts-Service-Profile = "1:test1"
VasExperts-Enable-Service = "9:on"
VasExperts-Enable-Service = "12:on"
```

In this example, the subscriber recieves two **different** prefixes:

- `Framed-IPv6-Prefix = 2001:cafe:32:106::/64` - DPI will allocate IPv6 addresses to a subscriber from this pool
- `Delegated-IPv6-Prefix = 2001:de1e:32:106::/64` - this delegated prefix is transmitted to CPE (if the CPE requests PD)

It is important to note:

1. for IPv6, the address **always** has to be bound with login. Login is a unique subscriber ID, which can be associated with many IPv4-addresses and IPv6-prefixes. Subscriber's login is specified in `Access-Accept` in attribute `User-Name` or `VasExperts-UserName`.
2. If the subscriber has several IPv6-prefixes (like in the example given - IPv6-prefix and PD-prefix), then such subscriber must be marked as multi-bind (`VasExperts-Multi-IP-User = 1` attribute).

`Session-Timeout` attribute sets the time for DPI session (same as accounting-session time): during this time all DHCPv6-requests from this client will be processed by DPI, using parameters previously issued by the Radius. After `Session-Timeout` seconds, the current accounting-session will be closed and DHCPv6-request will be transferred again in Radius Радиус Access-Request. If there is no `Session-Timeout` attribute in Radius responce, it is considered to be equal with fastdpi.conf-parameter auth_expired_timeout.

IPv6 prefix leasing time is set by fastdpi.conf-parameters bras_dhcp6_preferred_lifetime and bras_dhcp6_valid_lifetime. You can set the leasing time individually for each subscriber using the Radius attribute `DHCP-IP-Address-Lease-Time`: this attribute sets preferred lifetime; valid lifetime is twice as big.

Additional DHCPv6-options can be set with special VasExperts VSA attributes.