IPv6 Service Destination Option

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EXPERIMENTAL RFC: Goals

- Demonstrate that the VPN Service Option can deployed in production networks
- Demonstrate that security considerations have been sufficiently addressed
- Encourage replication of the experiment
- Encourage publication of experimental reports

VPN Types

- L2VPN [RFC6624]
- L3VPN [RFC4364]
- VPLS [RFC4761][RFC4762]
- EVPN [RFC7432]
- Pseudowires [RFC8077]

Common Architecture

- An ingress Provider Edge (PE) device tunnels customer data to an egress PE device.
- A popular tunnel technology for all VPN types is MPLS where the tunnel header includes an MPLS service label.
- The service label
  - Is imposed by the ingress PE and used by the egress PE.
  - Is not examined by any other routers along the path
  - Determines how the egress PE forwards the packet

Egress PE Processing

- Remove the tunnel header, exposing the customer data
- Query the Forwarding Information Base (FIB) to identify the interface through which customer data is forwarded
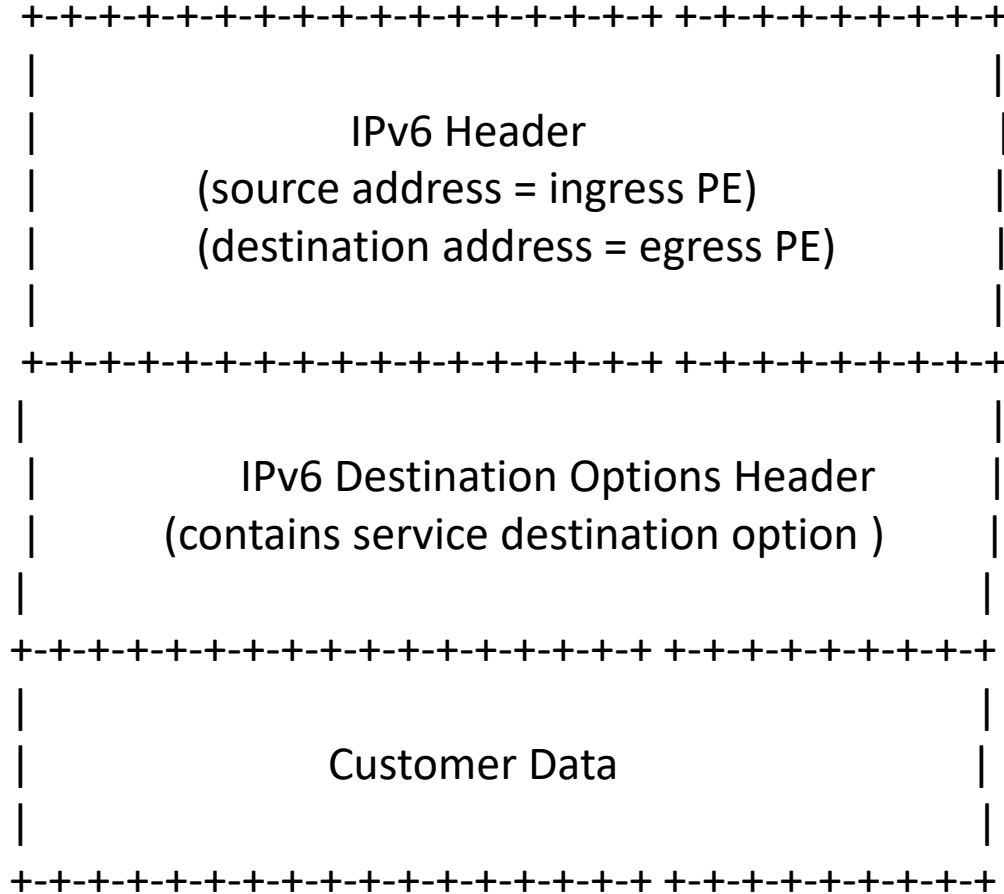 - The service label, found in the tunnel header, identifies the FIB entry

The Problem

- Some PE routers support do not support MPLS
  - But do support IPv6
- For example, the PE can be a server
  - The server NIC may not support MPLS

The Solution

- Replace the MPLS tunnel with a IPv6 tunnel
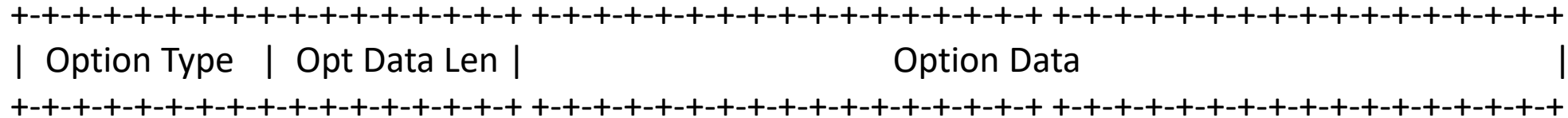- Replace the Service Label with the IPv6 Service VPN Destination Option

The Packet

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+
|                                                 |
|                                                 |
|              IPv6 Header                        |
|       (source address = ingress PE)             |
|       (destination address = egress PE)         |
|                                                 |
|                                                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+
|                                                 |
|                                                 |
|        IPv6 Destination Options Header          |
|       (contains service destination option )    |
|                                                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+
|                                                 |
|                                                 |
|              Customer Data                      |
|                                                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+
```

Destination address may
be different if a Routing Header
is present

Additional IPv6 extension headers
may be present

The IPv6 Service Destination Option

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|  Option Type   | Opt Data Len |                                Option Data                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+ +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

- Option Type: 8-bit selector.
  - VPN Service Option. MUST be RFC3692-style Experiment (0x5E).
- Opt Data Len: 8-bit unsigned integer.
  - Length of the option, in octets, excluding the Option Type and Option Length fields. MUST be set to 4.
- Option Data - 32-bits.
- High-order 12 bits: A checksum covering source address, destination address and option data
- Low-order 20 bits: Identifies either the outgoing interface or a VPN-specific portion of the FIB that will be used to determine the outgoing interface. Same value as MPLS Service Label

The Control Plane

- The Service Destination Option carries the same 20-bits as the MPLS service label

- Therefore, no changes to the control plane are required

  - The same mechanism that carries 20 bits of the MPLS service label today can carry the 20 bits of the Service Destination Option tomorrow.

Next Steps

- WG Last Call