

Lightweight 4over6
+
SD-nat (aka stateless DS-Lite)
=

Lightweight DS-Lite
(twice as light!)

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(Softwire item, presented here for feedback)

Motivations

- Simple extension to DS-Lite to push NAT function to CPE
- Eliminate per-flow state on AFTR
- Eliminate per-flow logs on AFTR
- Hub & Spoke model:
No mathematical IPv4 and IPv6 address coupling

Technical Matrix

CGN Port Management

Addr/Port Set Provisioning



Per-flow stateful

Per-subscriber stateful

Stateless

DS-Lite

Public 4over6

MAP-E, MAP-T, 4rd-u, etc.

Lightweight DS-Lite



Address Binding

Algorithmic Mapping

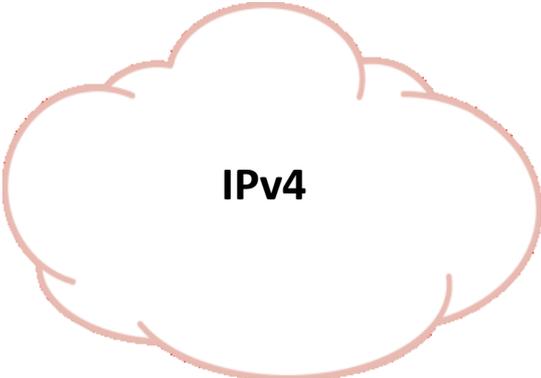
Benefits of allocating independently IPv6 and IPv4 address

- IPv6 addresses do not have to be allocated sequentially.
- Easily define and change IPv4 customer profiles (number of ports).
- IPv4 resources can be re-allocated freely.

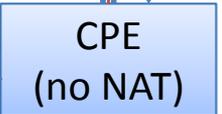
Not Tying IPv6 address to IPv4 address plus port range

- In general, removing the mathematical restriction allows the operator to deliver the service he wants to offer, in the way he wants to offer them.
- The price to pay is to provision and manage resources at a finer granularity.
- Introduce **per-subscriber state** on tunnel concentrator (AFTR)
 - **No per flow state!**

Classic DS-Lite Architecture

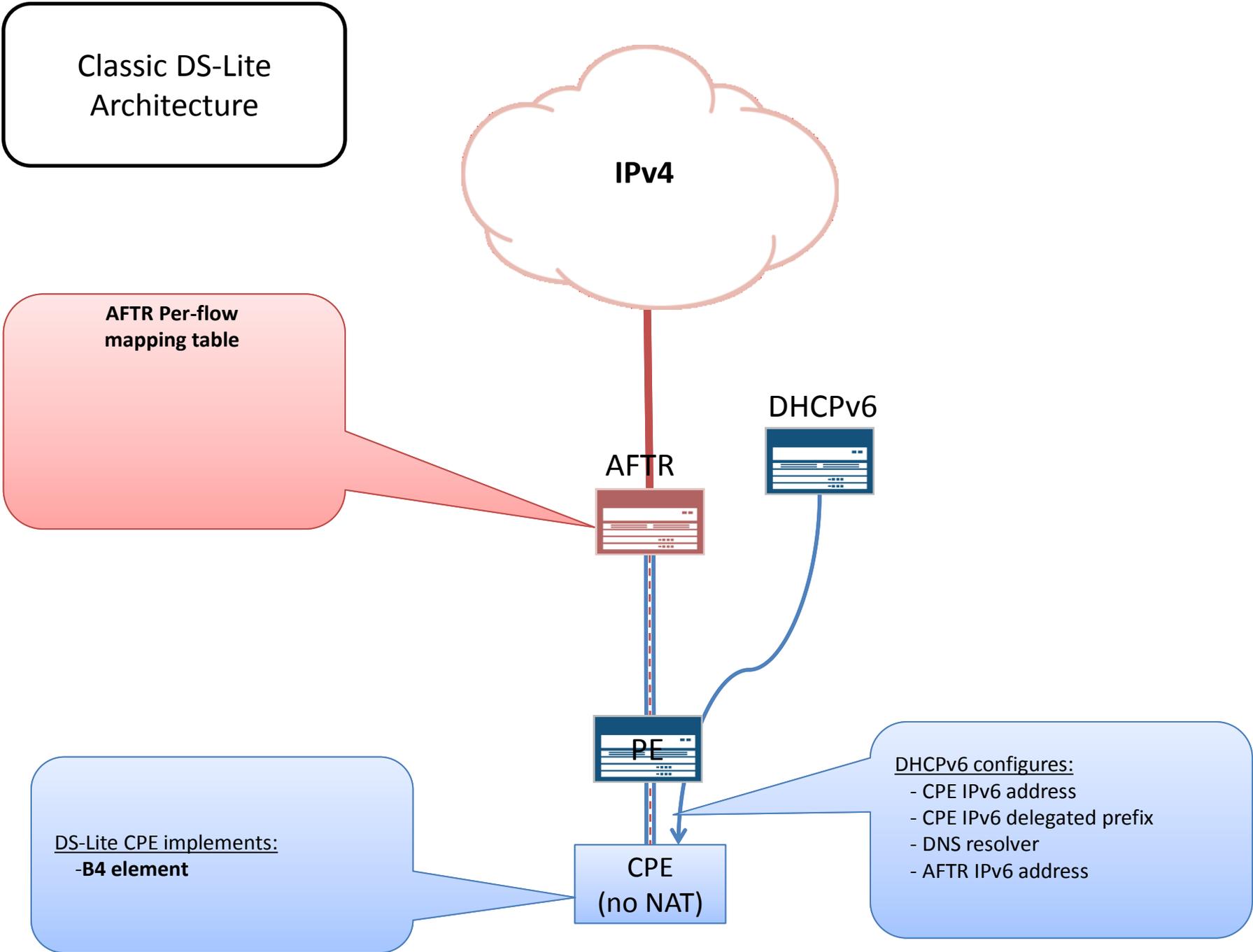


AFTR Per-flow mapping table

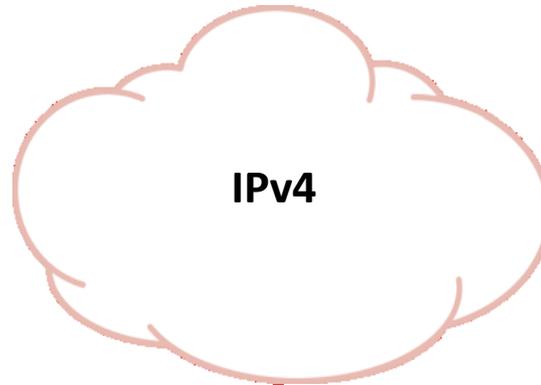


DS-Lite CPE implements:
-B4 element

DHCPv6 configures:
- CPE IPv6 address
- CPE IPv6 delegated prefix
- DNS resolver
- AFTR IPv6 address



Lightweight DS-Lite
ICMP Architecture
Proposal Option



AFTR Per-subscriber
mapping table

IPv6	IPv4	Port Range
2001:db8::1	192.1.2.3	1000-1999
2001:db8::2	192.1.2.3	2000-2999

AFTR

DHCPv6

DHCPv4

ICMPv4 "Port Restricted"
over IPv6 tunnel

DHCPv4 (over IPv6)
configures
CPE B4 IPv4 address

Lightweight DS-Lite CPE
implements:

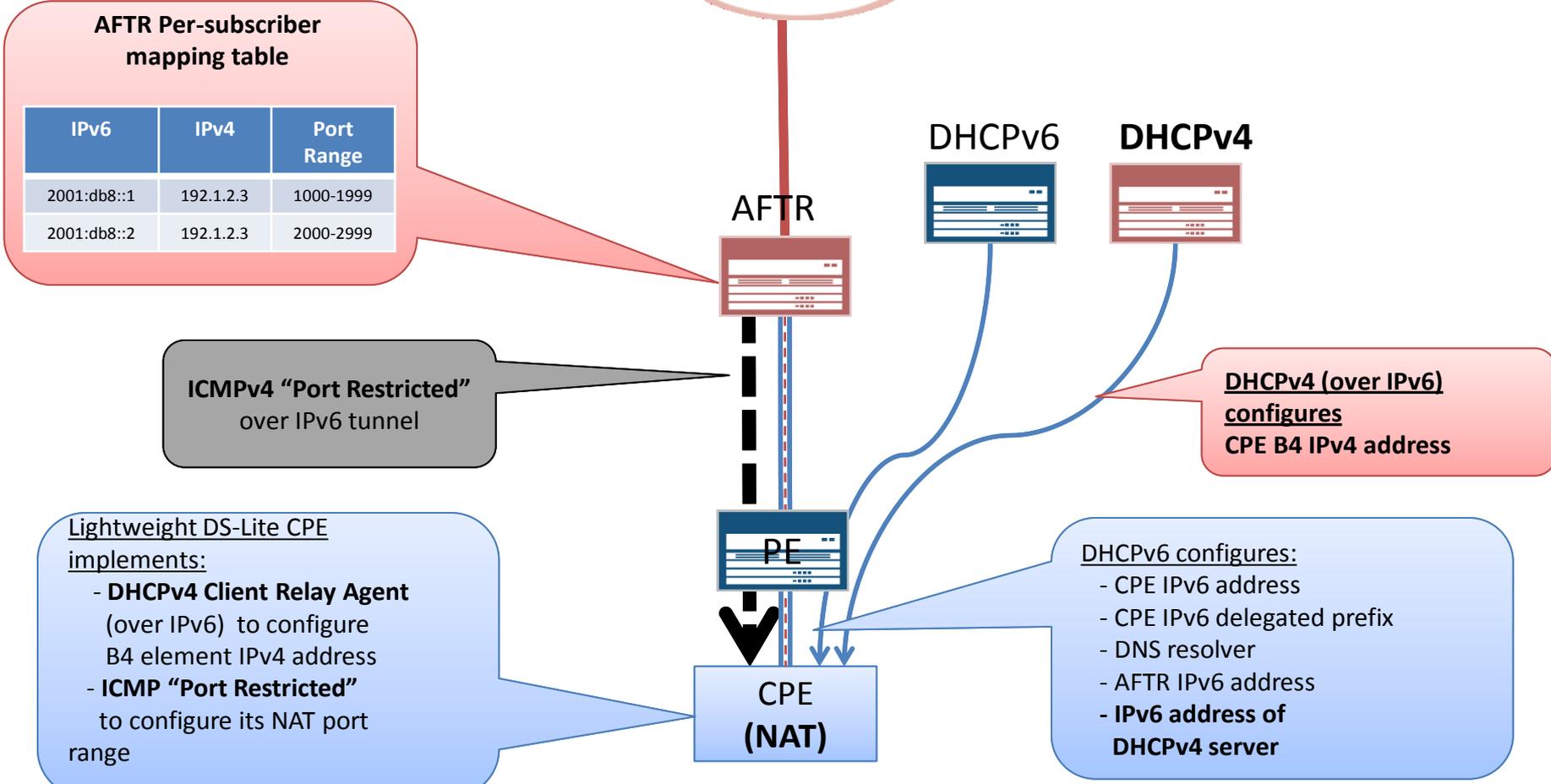
- **DHCPv4 Client Relay Agent** (over IPv6) to configure B4 element IPv4 address
- **ICMP "Port Restricted"** to configure its NAT port range

PE

CPE
(NAT)

DHCPv6 configures:

- CPE IPv6 address
- CPE IPv6 delegated prefix
- DNS resolver
- AFTR IPv6 address
- **IPv6 address of DHCPv4 server**



ICMP port restricted message as proposed method to communicate port restricted range

- Under discussion in Softwire
 - AFTR must notify the CPE when port is out of assigned range with an ICMP message
 - Can we re-use existing ICMP message:
 - Port exceeded
 - Administratively prohibited
 - Other?
 - Or do we need a new ICMP message?

Security Considerations

- Require ingress filtering on IPv6 access network
- (MaxPort – MinPort) MUST be ≥ 64
- IPv6 SRC MUST be AFTR's IPv6 address
 - As configured on CPE (learned from DHCPv6)
- IPv6 DST MUST be CPE's IPv6 address
- IPv4 SRC MUST be 192.0.0.1
 - AFTR well known address
- IPv4 DST MUST be CPE's IPv4 address