

Requirements to Multi-domain IPv6-only Network

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Basic points about IPv6-only

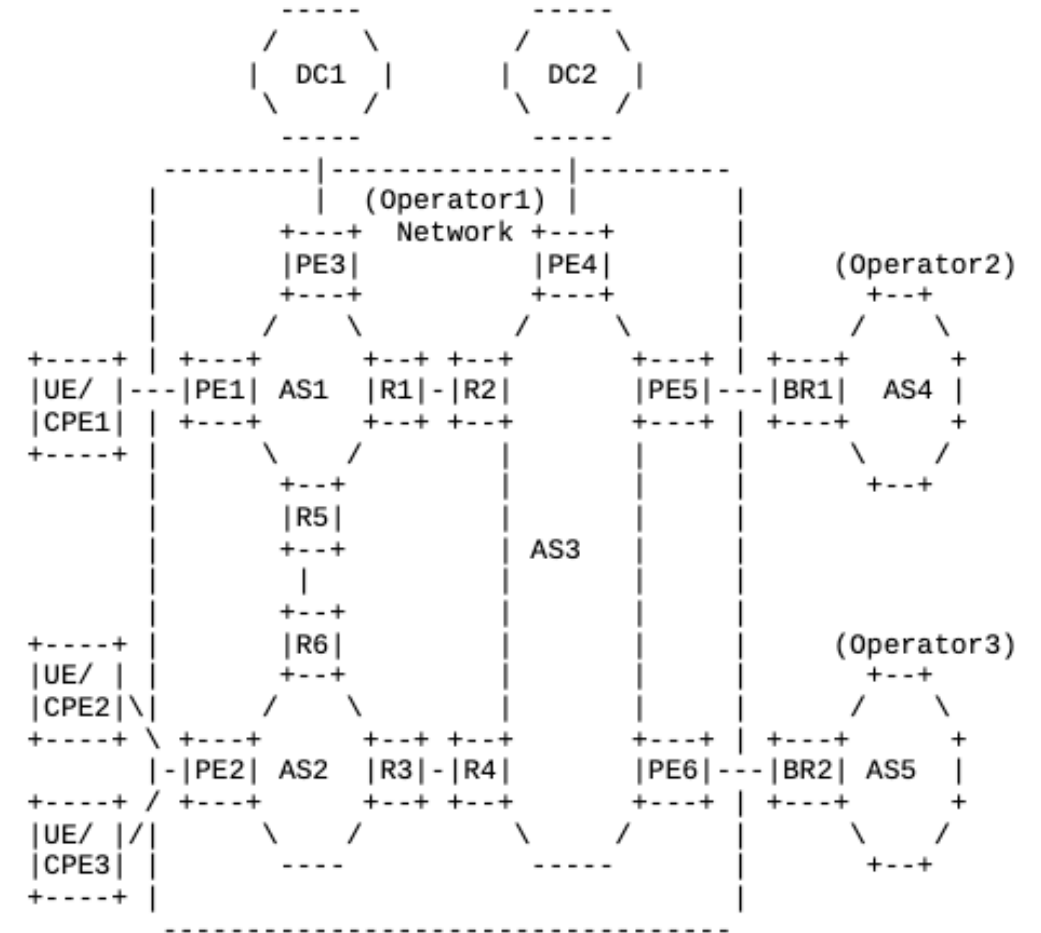
- IPv6-only is the ultimate stage
 - Running an IPv6-only network would reduce operational expenditures and optimize operations as compared to an IPv4/IPv6 dual-stack environment.
- IPv4aaS should be considered
 - In order to extend the service in the case of IPv4 address depletion, operators need to provide IPv6 services and keep the ability for users to access the global IPv4 Internet.
- The deployment is related to IPv6 traffic ratio
 - When IPv6 usage increases to a certain limit, it would be better to consider IPv6-only.

Existing IPv6-only approaches

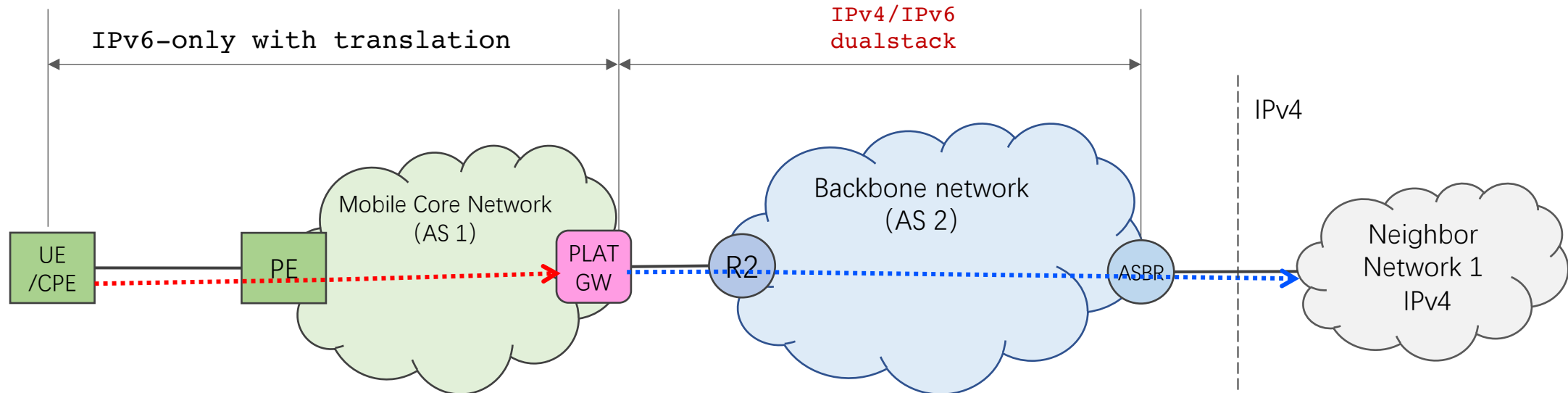
- 464XLAT[RFC6877], Stateful, translation
- MAP-E[RFC7597], Stateless, encapsulation
- MAP-T[RFC7599], Stateless, translation
- DS-Lite[RFC6333], Stateless or Stateful, encapsulation
- Lightweight 4over6[RFC7596], Stateful, encapsulation
- 4rd[RFC7600], Stateless, encapsulation
- Softwire Mesh Framework [RFC5565], Stateful, encapsulation
- etc.

Overview of multi-domain network

- Network composed of multiple autonomous system(AS)es, different ASes may serve different scenarios, such as metro network, backbone network, 4G or 5G mobile core, cloud/data center network, and are often managed by different departments or institutions, using different routing and security policies.



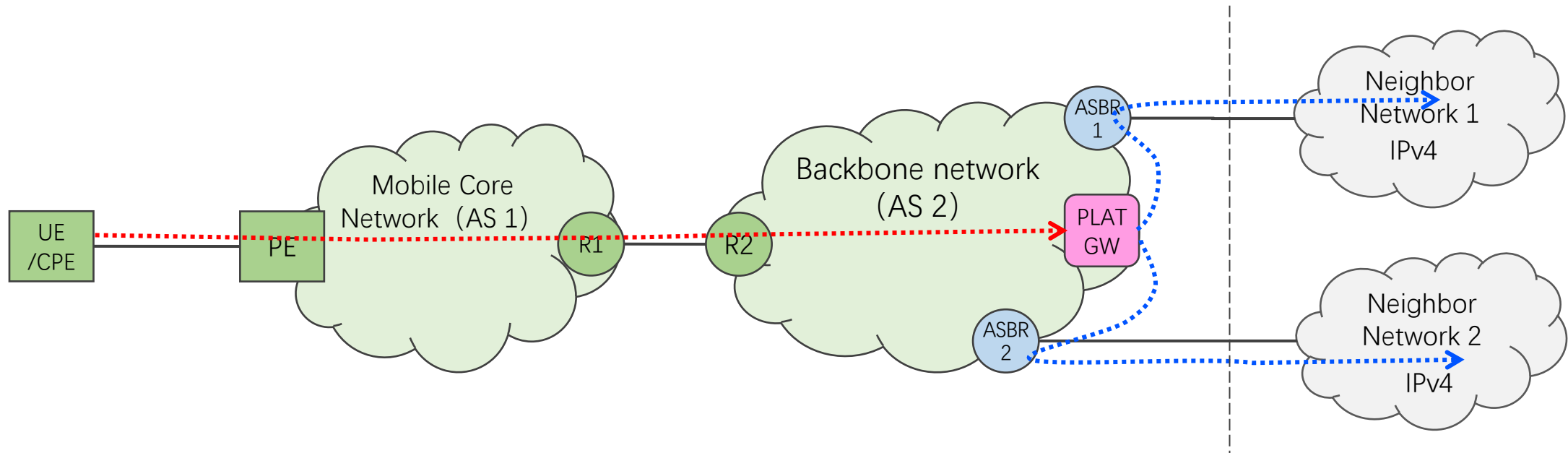
Issue 1: Partial IPv6-only deployment



PLAT deployed at the egress of Mobile network

Issue: Partial IPv6-only, IPv6-only in AS1 and IPv4/IPv6 dualstack in AS2

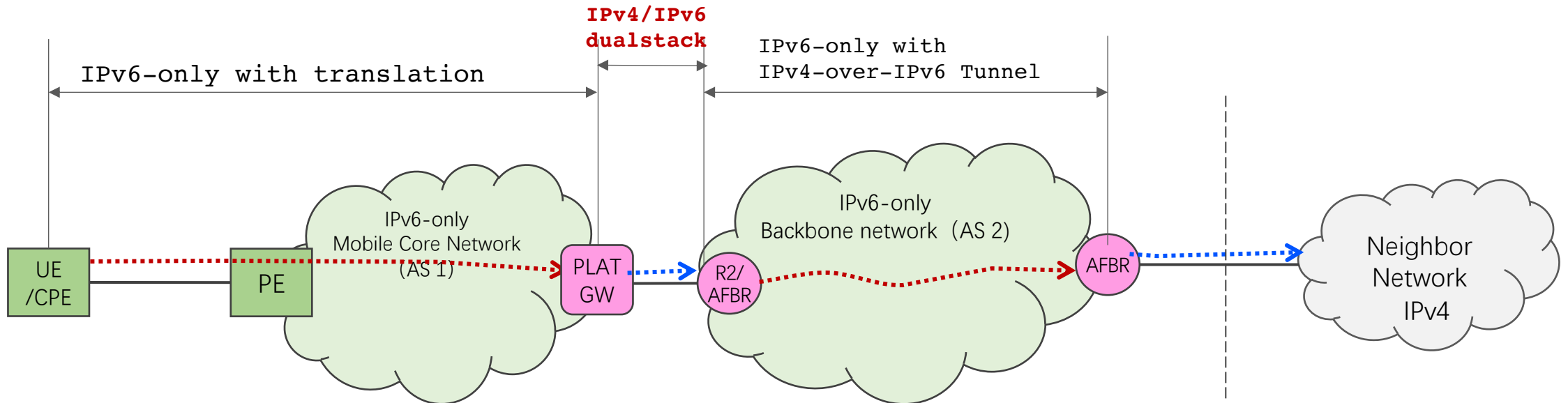
Issue 2: Unnecessary traffic winding



PLAT deployed at the edge of the backbone network

Issue: All the traffic to IPv4 networks will go through PLAT GW and will go the long way round, the data-path is less optimal.

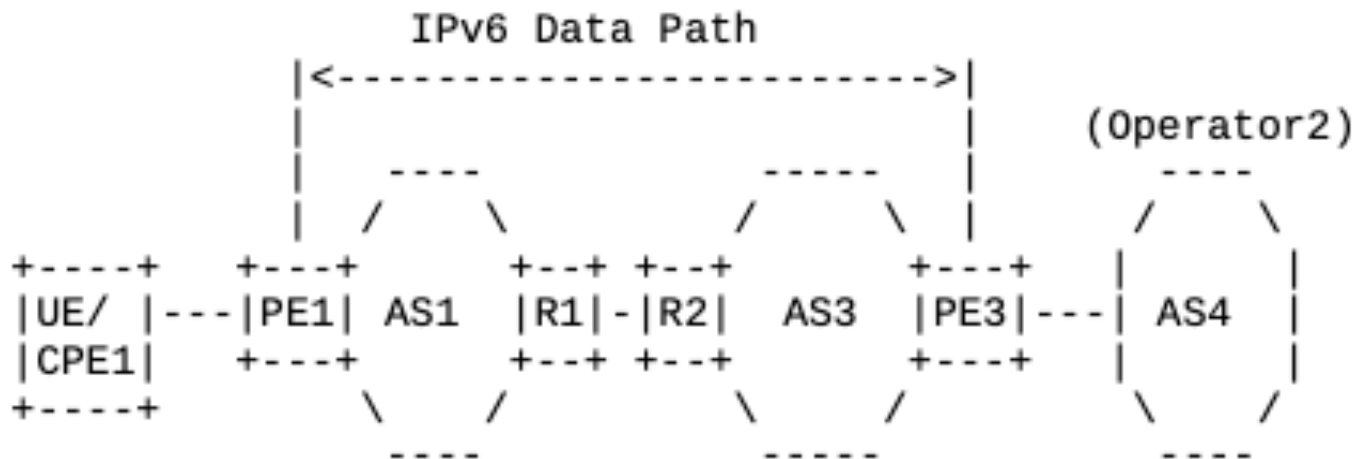
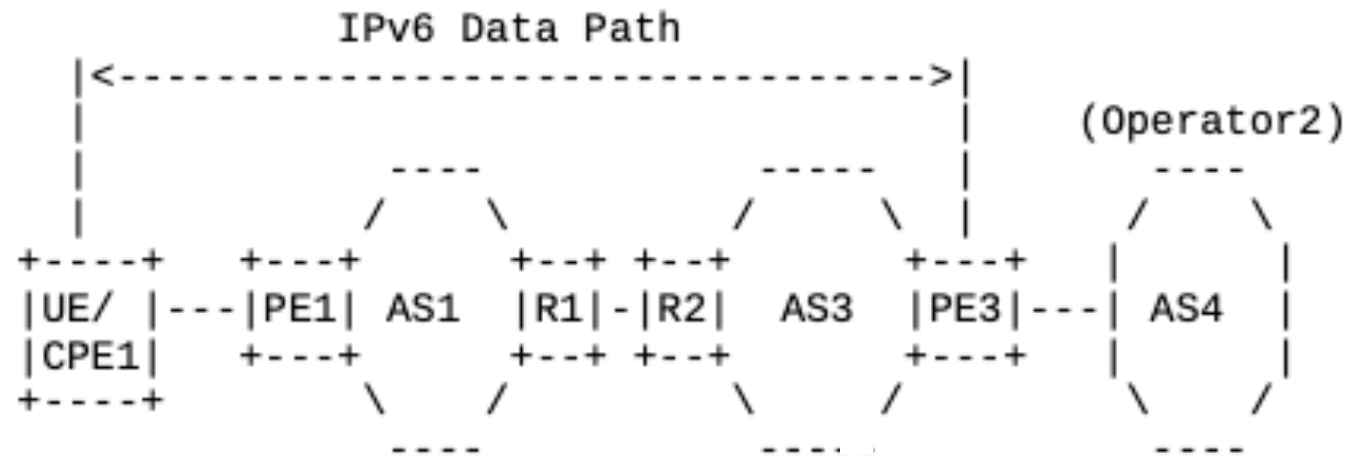
Issue 3: Multiple data format for a given data flow



464XLAT for local network and tunnel in Backbone network

Issue: IPv6-only islands inter-connected by dual-stack BGP peers. IPv4-embedded IPv6 packets need to be transformed back to IPv4 packets at the egress of AS1, and then back to IPv6 in the next domain, and the number of conversion points will increase along with the number of ASes.

A framework is needed for multi-domain IPv6-only network



Scenarios considered in multi-domain IPv6-only Network

#	description
Scenario 1	IPv6 user to IPv4 server, IPv6-only user accesses IPv4 services hosted in cloud data centers.
Scenario 2	IPv4 user to IPv4 server, IPv4-only user accesses IPv4 services hosted in cloud data centers.
Scenario 3	IPv6 user to IPv6 server, IPv6-only user accesses IPv6 services hosted in cloud data centers.
Scenario 4	DC-to-DC, IPv6-only provide communications between VMs hosted cloud data centers, despite they are IPv4, IPv6 or IPv4/IPv6 dual-stack.
Scenario 5	Transit for neighbor networks, IPv6-only network serves as an interconnection between several segregated IPv4-only network, IPv4 packets are transported over the IPv6 network between IPv4 networks.
Scenario 6	IPv6-only eBGP Edge peering in Internet Exchange Point (IXP)
Scenario 7	5G Transport service, SD-WAN, etc.

Requirements for IPv4 service delivery

- Requirement 1: beneficial to wider IPv6 adoption
- Requirement 2: IPv4-as-a-Service
- Requirement 3: end-to-end
- Requirement 4: support of translation and encapsulation
- Requirement 5: controller independent
- Requirement 6: user stateless at the border gateway
- Requirement 7: high scalability
- Requirement 8: SRv6 applicable
- Requirement 9: incremental deployment

Moving forward

- More comments and suggestions are welcome!
- Adopt document as v6ops WG item?

Thank you !
Q&A