4V6 – stateless 4Via6

http://tools.ietf.org/html/draft-dec-stateless-4v6

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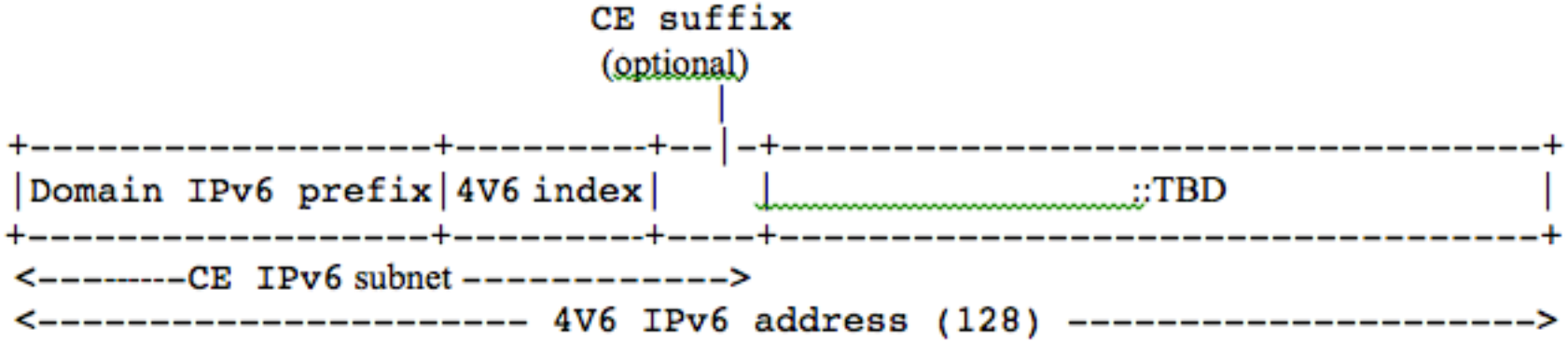
Introduction

- Motivation for stateless solutions can be found in: draft-operators-softwire-stateless-4v6-motivation
- A number of stateless solutions have been proposed.
  - 4rd, 4v6 (encapsulated or translated mode)
  - dIVI-PD (translated mode)
- These stateless solutions have shared characteristics; commonly termed stateless 4V6.
  - Main differences lies in algorithm and form of transport: v4-v6 Mapped-Encapsulation or v4-v6 Translation
- This presentation focuses on the operational considerations of Stateless4V6 and its forms of transport
- It also looks at the 4V6 impact when applied to wider industry standard architectures

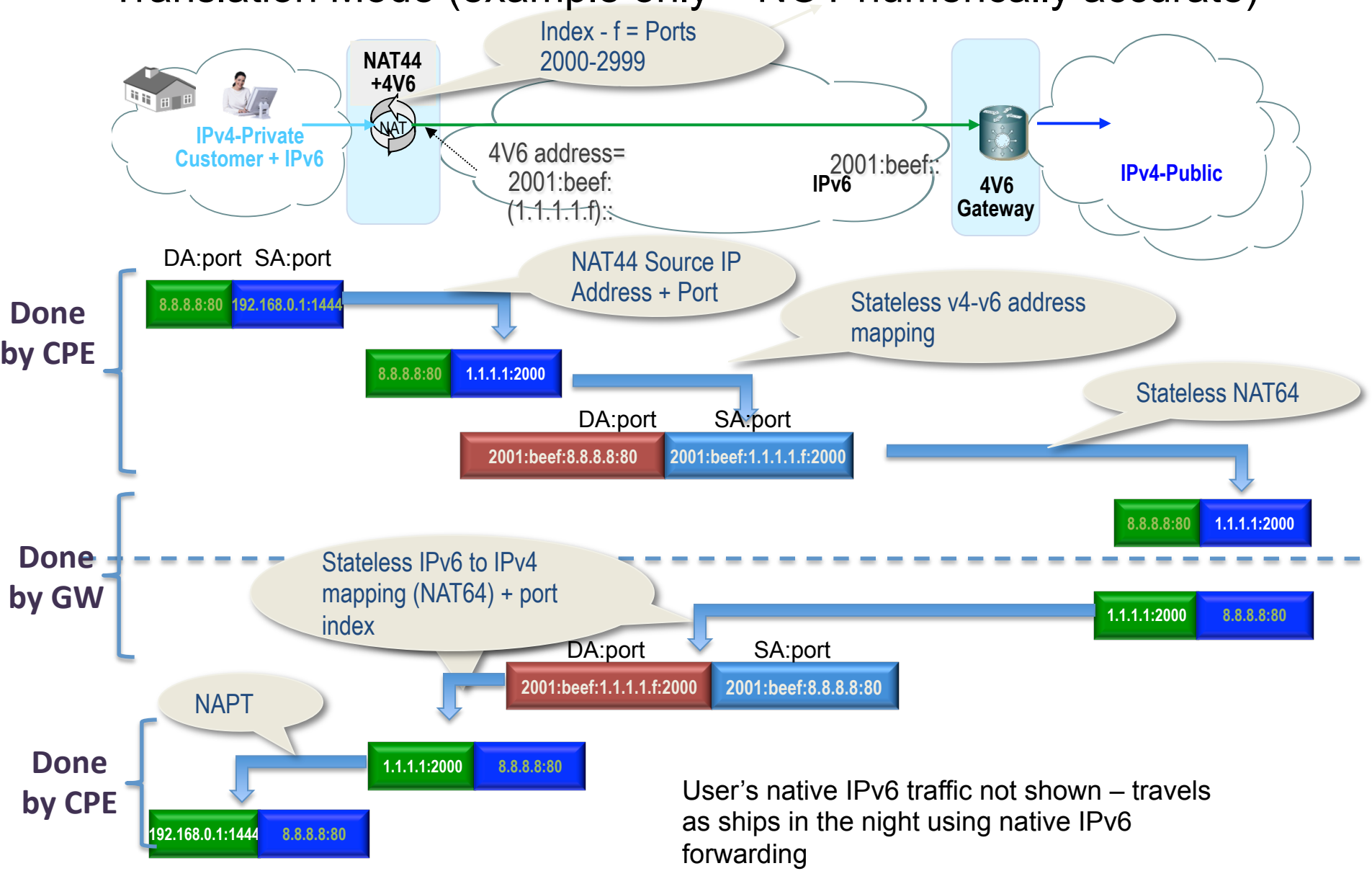
4V6 IPv6 Address



- CE IPv6 subnet is assigned announced via DHCPv6-PD or RA (/64)
  - This is NOT in addition to another PD or RA prefix
- 4V6 index encodes all or part of the IPv4 address + a port index.

Stateless 4V6

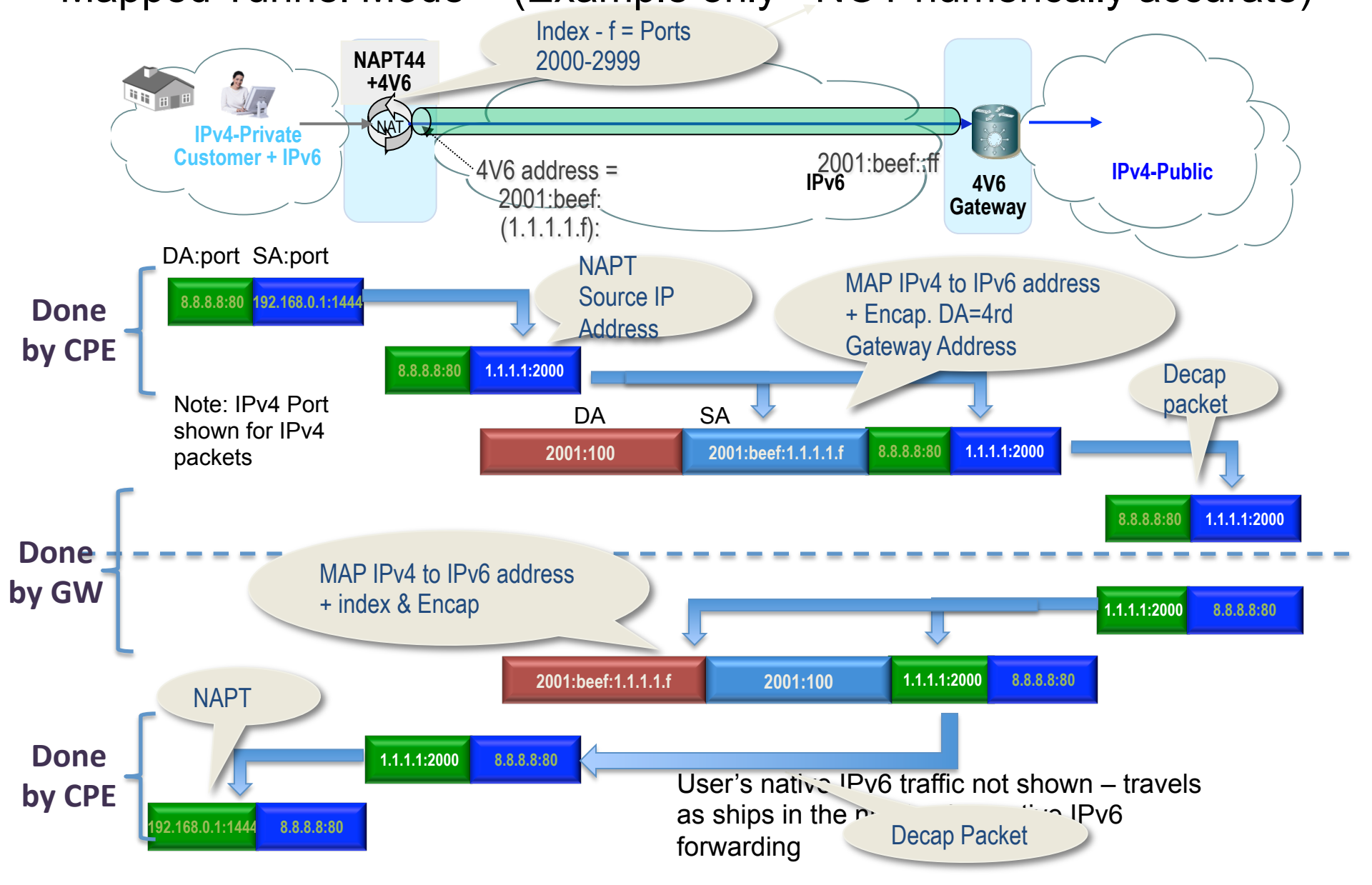
Translation Mode (example only – NOT numerically accurate)



User's native IPv6 traffic not shown – travels as ships in the night using native IPv6 forwarding

Stateless46

Mapped Tunnel Mode – (Example only - NOT numerically accurate)



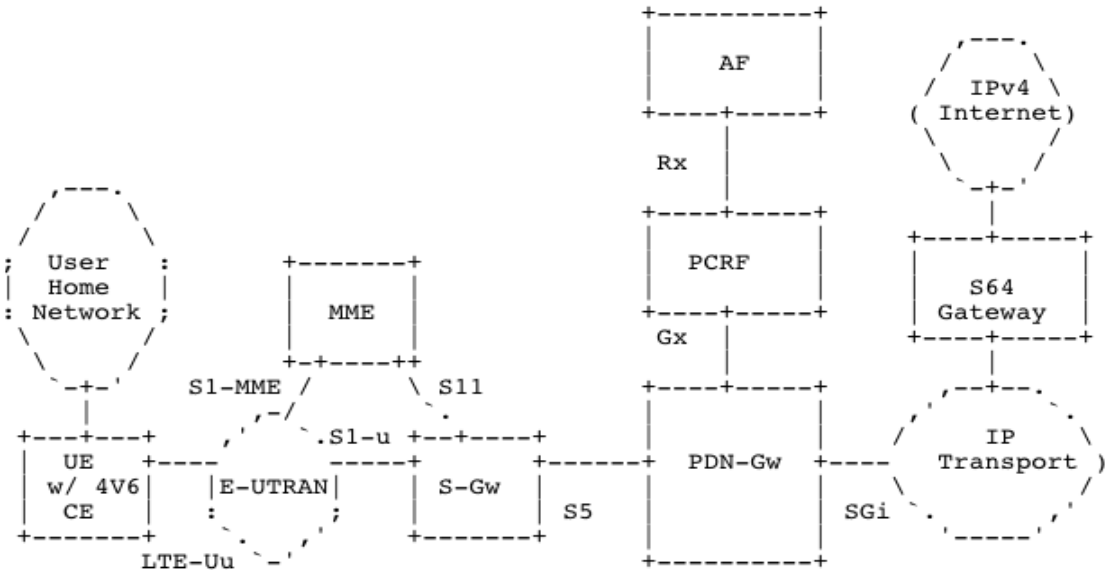
Stateless 46

Comparison Summary

	4V6 Mapped Tunnel Mode	4V6 Translation Mode
Base technology	Port restricted NAPT44 + IPv4 in IPv6 mapped encapsulation.	Port restricted NAPT44 + modified stateless NAT64
Transport non-UDP/TCP traffic?	No	No
Location of NAPT44 function	CPE	CPE
IPv4 Forwarding paradigm at relay	L3 + L4 lookup	L3 + L4 Lookup
IPv6 addressing constraints	Prefix distributed via regular DHCPv6-PD or SLAAC. NO ADDITIONAL Prefix required.	Prefix distributed via regular DHCPv6-PD or SLAAC. NO ADDITIONAL Prefix required.
IPv4 addressing constraints	Sharing fixed per IPv4 subnet/domain	Sharing fixed per IPv4 subnet/domain
Overhead in relation to payload of a) 550 bytes b) 1400 bytes	a) 4.36% b) 1.71%	a) 0% b) 0%
ICMPv4 NAT/Markup needed	Yes	Yes
IPv4 Checksum recalculation required	Yes - with ICMPv4 support	Yes
Operation and Provisioning Extensions	(DHCPv6, maybe SLAAC, TR69)	(DHCPv6, maybe SLAAC, TR69)
Supports IPv4 Options	Yes	No
Supports non-shared IPv4 usage/ assignment	Yes	Yes

Operation
4V6 in a 3GPP system

- 3GPP system functionality is defined to support an extensive set of IP network service requirements,
  - Eg Per subscriber QoS, charging, data volume plans.
- System is in common deployment. IPv6 fully supported in Release 8/9
- Key functionality is the representation and signaling across various interfaces of the user's virtual connection (Bearer). This is specified in terms of IP Filters.
- 3GPP currently defines IPv4 & IPv6 traffic filters.
- No clearly defined way how to represent IPv4inIPv6 traffic *alongside* regular IPv6 traffic.
  - Possible options are an additional (default) bearer (ie additional session), or a new bearer type.

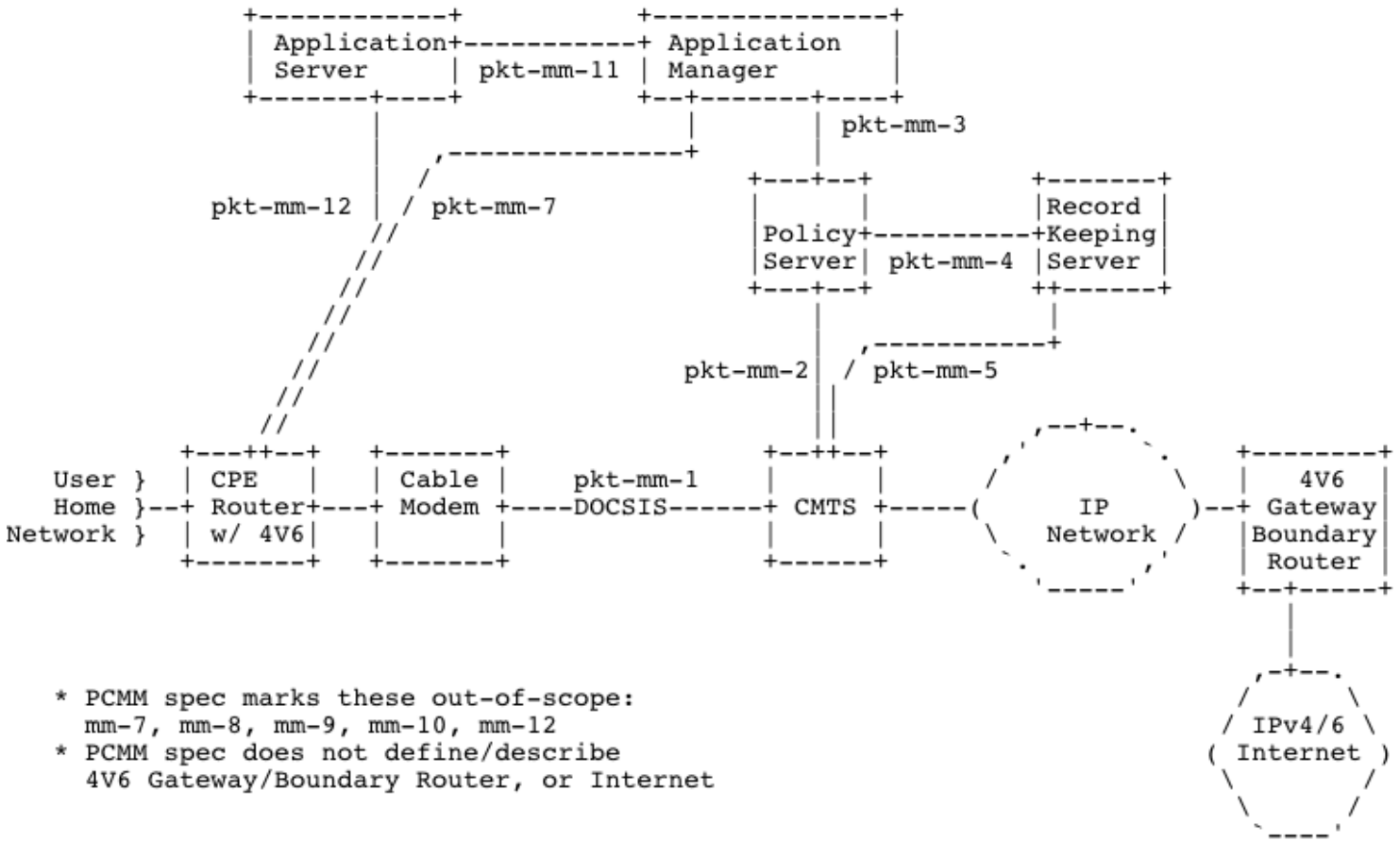


Operation
4V6 in 3GPP

	4V6 Mapped Tunnel Mode	4V6 Translation Mode
User Data Plane at PDN-Gw	IPv4 over IPv6 over GTP-U over UDP over IP	IPv6 over GTP-U over UDP over IP
Gx (Diameter)	Impacted: v4 over v6 in TFT Filter and Flow descriptors	No visible impact
Rx (diameter)	Impacted: Expressing v4 over v6 Flows	No visible impact
S5 (GTP)	Impacted if new Bearer type is defined	No visible impact
Additional bearer	Possibly required	Not required
PDN-Gw	New TFT capability, IP Gate functionality + changes to Gx and any S5/S7 interfaces	No impact
SGw	No visible impact (except when new bearer is used)	No impact
PCRF	Impacted for both IPv6 and IPv4-only applications	No impact for IPv6 applications. Feature to map IPv4-IPv6 addresses needed only for IPv4-only applications
AF	Flow based applications impacted	No visible impact.
UE	4V6 CPE	4V6 CPE
LTE-Uu	Likely changes required if signalling new bearer type	No visible impact
Lawful Intercept	New rules for tunnel support	No visible impact

Operation
4V6 in a PCMM system

- Cable Labs



Operation
4V6 in PCMM

	4V6 Mapped Tunnel Mode	4V6 Translation Mode
Pkt-mm-1	Impacted. Needs new flow definition	No impact
Pkt-mm-2 (COPS)	Impacted. Needs extension to support IPiniP flows	No impact
Pkt-mm-3 (COPS)	Impacted. Needs extension to support IPiniP flows	No impact
eRouter/CPE	Requires 4V6 support	Requires 4V6 support
CMTS	Impacted. Needs extension to support IPiniP flows	No impact
Policy Server	Impacted. Needs extension to support IPiniP	No impact
Application Manager	Impacted. Needs extension to support IPiniP	No impact for IPv6 applications. IPv4 only applications require feature

Conclusion

- No critical technical issues with 4V6 and either the 4V6 mapped-tunnel or translation based modes
  - Both approaches represent valid choices
- Translated (non encapsulated) transport appears to be operationally less impactful to broader systems and services
  - Re-uses native IPv6 network features and system interfaces
  - Does not require numerous IPv4 extensions to standard architectures that already support IPv6
- Operational impact of both approaches should be documented and trade-offs outlined/clarified.