RIPE 62

„On-demand IPv4 Address Provisioning in Dual-Stack PPP deployment scenarios”

Amsterdam, 2nd–6th of May 2011

Olaf Bonneß, Karsten Fleischhauer (Deutsche Telekom)

Erleben, was verbindet.

On-demand IPv4 Address Provisioning in Dual-Stack PPP deployment scenarios.

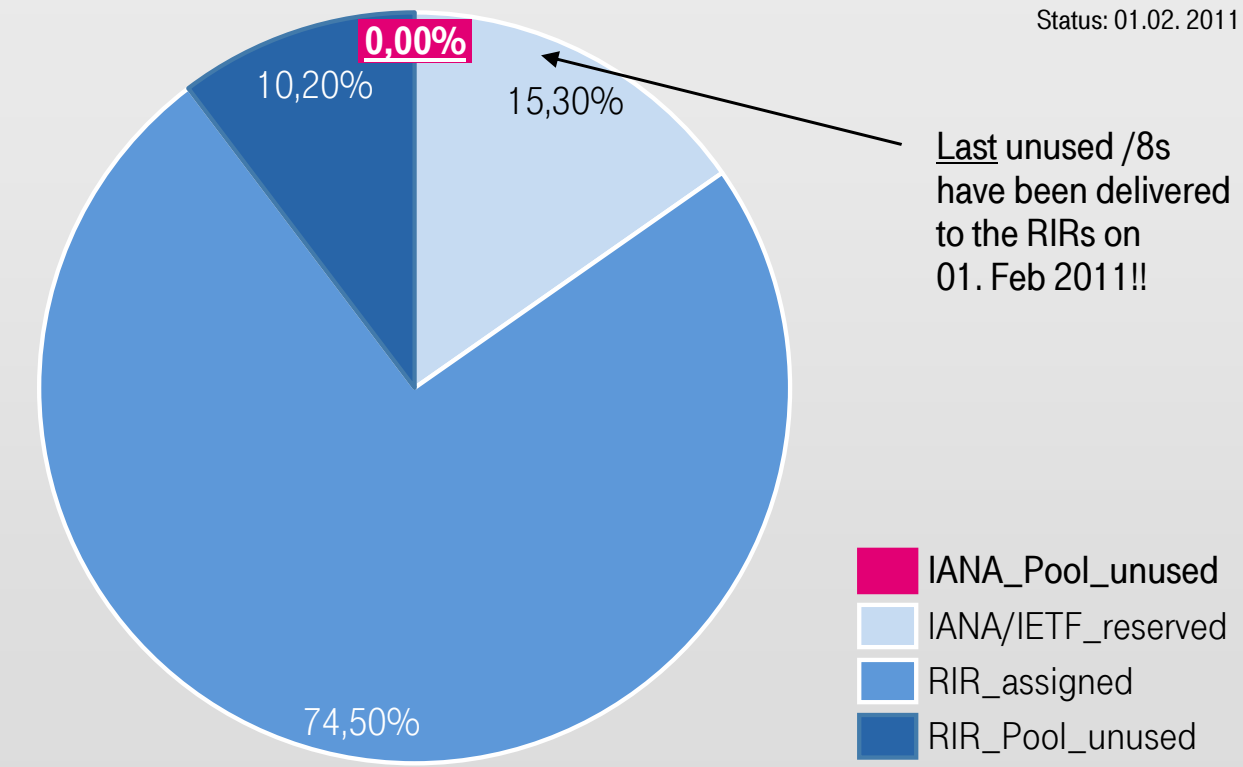
Agenda

1. Introduction / Motivation.
2. Explanation of use case.
3. Description of Mechanism “On-demand IPv4 Address Provisioning”.
4. Summary / Conclusion.
5. Discussion / Question and Answers.

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Motivation. The IPv4 Addresses are nearly gone.

Status Quo of Global IPv4 Address Pool



Source: T-Labs

Address pools

- IANA_Pool_unused:

  Unused/Free IPv4 address space.
- IANA/IETF_reserved:

  IPv4 address ranges that have been reserved by IETF/IANA and that can not be used for freely assigning them to end systems (e.g. Multicast, 10.0.0.0/8, 240.0.0.0/4 etc.).
- RIR_Pool_unused:

  IPv4 address ranges that have been delegated from IANA to the RIRs in order to ensure that the RIRs can assign addresses to end customers for the next 9 month.
- RIR_assigned:

  “In use” IPv4 addresses assigned to ISPs/end users.

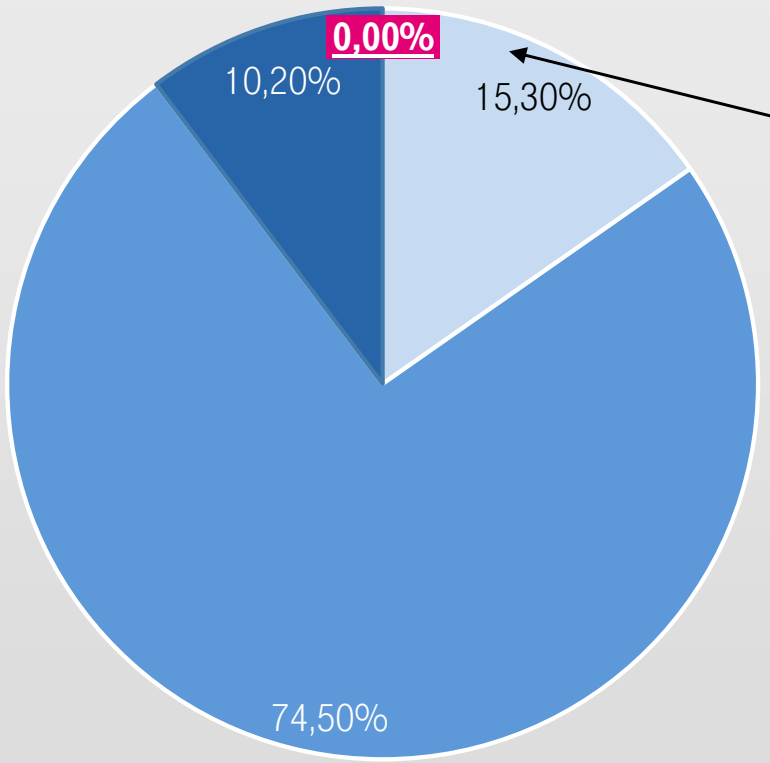
Today only the RIRs have still a few unused IPv4 addresses in their stocks!!

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Motivation. The IPv4 Addresses are nearly gone.

Status Quo of Global IPv4 Address Pool

Status: 01.02. 2011



Last unused /8s have been delivered to the RIRs on 01. Feb 2011!!

- IANA_Pool_unused
- IANA/IETF_reserved
- RIR_assigned
- RIR_Pool_unused

Source: T-Labs

Address pools

- IANA_Pool_unused:

  Unused/Free IPv4 address space.

- IANA/IETF_reserved:

  IPv4 address ranges that have been not end

delegated from IANA to the RIRs in order to ensure that the RIRs can assign addresses to end customers for the next 9 month.

- RIR_assigned:

  "In use" IPv4 addresses assigned to ISPs/end users.

01.02.2011 10:47 heise Netze « Vorige | Nächste »

IPv4-Adresspool ausgeschöpft

vorlesen / MP3-Download

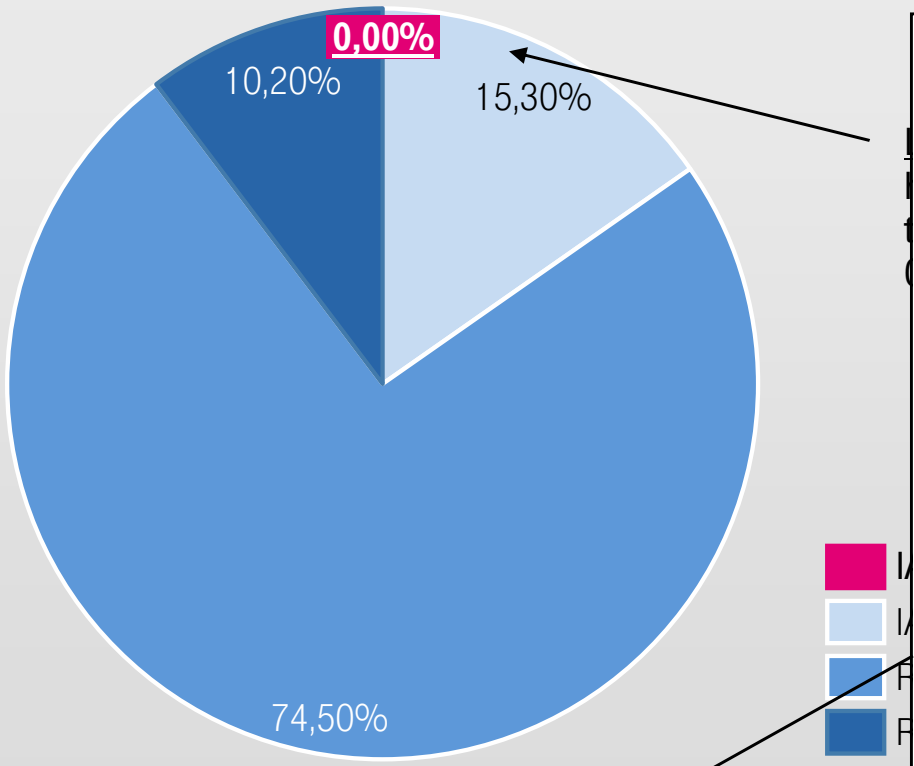
Die für die Vergabe von IP-Adressen zuständige IANA (Internet Assigned Numbers Authority) hat heute dem Asia-Pacific Network Information Centre (APNIC) zwei /8-IPv4-Adressblöcke zugeteilt, gab die regionale Internet-Registry (RIR) für Asien und Australien heute in einer Mitteilung bekannt. Die beiden Blöcke 39/8 und 106/8 waren damit die letzten beiden, für die die IANA das alte Vergabeverfahren angewandt hat.

Today only the RIRs have still a few unused IPv4 addresses in their stocks!!

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Motivation. The IPv4 Addresses are nearly gone.

Status Quo of Global IPv4 Address Pool



Source: T-Labs

Address pools

- IANA Pool unused:

APNIC

Phone +61 7 3858 3100
Fax +61 7 3858 3199
URL www.apnic.net
E-mail info@apnic.net

Key Turning Point in Asia Pacific IPv4 Exhaustion

IPv4 "Final Stage" Begins Today

Brisbane, Australia – ***6:00 (UTC+10) Friday, 15 April 2011***

APNIC activates Final /8 Policy

Today the Asia Pacific Network Information Centre (APNIC) reached the last block of Internet Protocol version 4 (IPv4) addresses in its available pool, activating a major change in regional delegation policy.

This event is a key turning point in IPv4 exhaustion for the Asia Pacific, as the remaining IPv4 space will be 'rationed' to network operators to be used as essential connectivity with next-generation IPv6 addresses. All new and existing APNIC Members who meet the current allocation criteria will be entitled to a maximum delegation of a /22 (1,024 addresses) of IPv4 space.

APNIC Director General Paul Wilson explained the Asia Pacific region is the first to reach the point of being unable to meet IPv4 demand. This is due to the unprecedented fixed and mobile network growth the region is experiencing.

Today only some of the RIRs have still a few unused IPv4 addresses in their stocks!!

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Motivation. What went wrong with IPv6?

Lack of IPv6 deployment ...

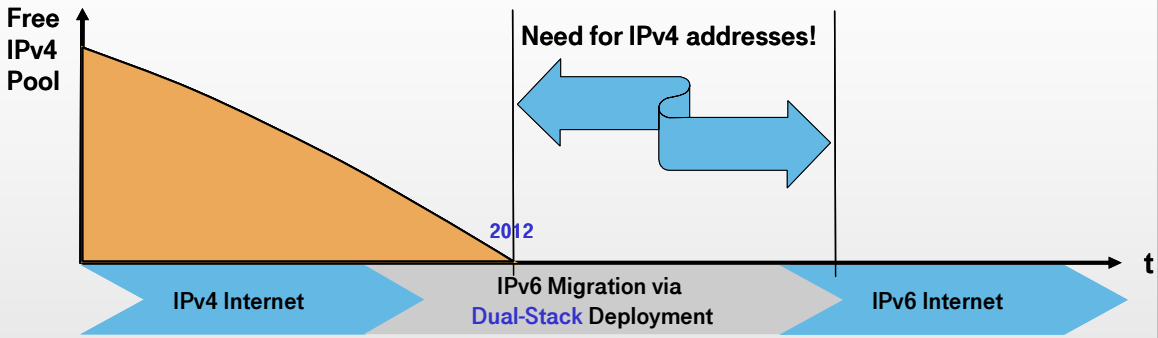
... because of:

- No compelling business case
- Complex network scenarios.
- Leaks in standardization
  - Long standardization cycles
  - BBF, 3GPP, IETF, ...
- Lack of implementation
  - Partially incomplete
  - Not in all devices where needed (FW, LB, HG, **...**)
- Mismatch in timelines
- Missing customer requests, **...**

"The foreseeable IPv6 deployment does not allow to serve customer with IPv6-only connectivity in mid-term."

Resulting challenge

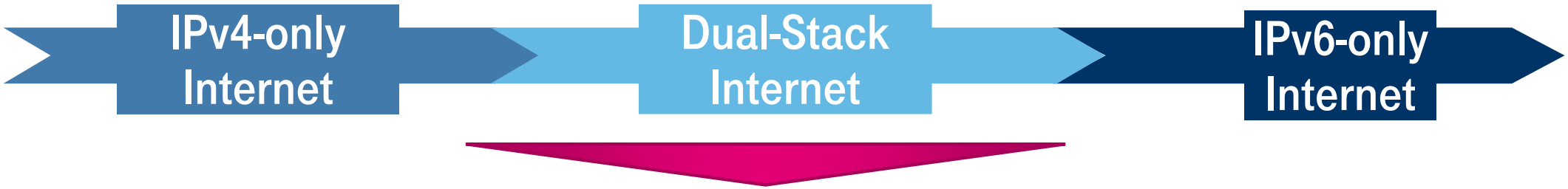
- **Dual-Stack IPv6 integration approach does not save any IPv4 address !!**



How to realize an IPv4 service continuity and Dual-stack-based IPv6 integration strategy if no IPv4 addresses are available anymore past 2011/2012?

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Motivation. Solution approaches to IPv4 Address Exhaustion.



(Theoretically) Possible methods to extend the IPv4 usage to ensure IPv4 service continuity.

1. Increase IPv4 address efficiency
2. Shift always on traffic to IPv6 (e.g. Voice over NGN, Presence etc.)
3. Time multiplexing of public IPv4 addresses ➡ On-demand IPv4 Address Provisioning.
4. Multiple usage of private IPv4 addresses - regionalization of networks
5. Introduction of NAT within the Service Provider network
   - NAT 444
   - Dual-Stack lite
   - Gateway Initiated Dual-Stack lite, ...
6. IPv4-IPv6 Protocol Translation

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Use case description.

Use case description and other solution approaches

(Main) Targeted Usage Scenario	▪ **Dual-stack PPP deployment.** ▪ **Provider provisioned, routing Home Gateway / Remote Gateway (RG) / CPE.** ▪ **All permanent / always-on services are already running on top of IPv6 (VoIP, DNS etc.).** ▪ **Provisioning / releasing of public IPv4 address only on –demand.**
Why not using 2 PPP Sessions? (1 IPv4 and 1 IPv6)	▪ Avoiding scalability issues on HG and NAS. ▪ Additional costs for Licenses for # of user. ▪ Simplify (traffic class based) traffic control. (No 2 PPP sessions for 1 customer). ▪ No additional HG configuration needed (multiple user credentials etc.).
Why not using CGN?	▪ CGN (LSN) as last resort solution (complexity, costs etc.) may not become necessary when deploying on-demand IPv4 address provisioning. ▪ Estimated costs in aggregation networks equal to IPv6 introduction. ▪ Will impact the customer experience. ▪ Does not provide an IPv4 exit strategy.

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Presumptions.

Presumptions for "On-demand IPv4 Address Provisioning"

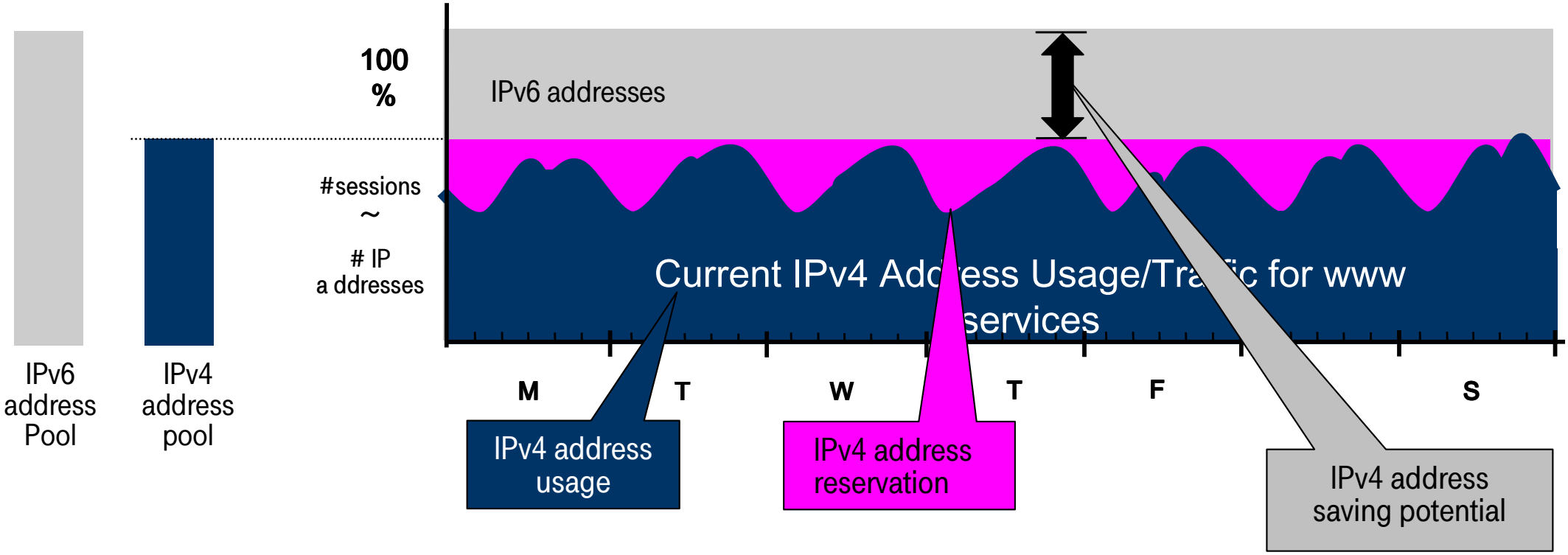
Good IPv6 connectivity is needed; Always-on (as well as other permanent) services must be provided on top of IPv6. "Most" connections are assumed to be IPv6.

Home Gateway – Customer Devices	▪ Dual-Stack capabilities on network and application layer ▪ Traffic and/or timer triggered detection of IPv4 communication demand => assigning / releasing of IPv4 parameters via IPCP.
Network / Services	▪ Dual-Stack capabilities on network and service layer. ▪ Support for assigning and releasing IPv4 addresses during a Dual-Stack PPP session - local on NAS or RADIUS/DIAMETER based. (Detailed RADIUS/Diameter communication is no part of this presentation).
Protocol	▪ Based on well known NCP (IPCP and IPv6CP) mechanism as described in related PPP RFCs.

Mechanism is part of BBF-standardization (WT-242) – Starting discussion in IETF. Interest and support signaled by several Telcos and Vendors.

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

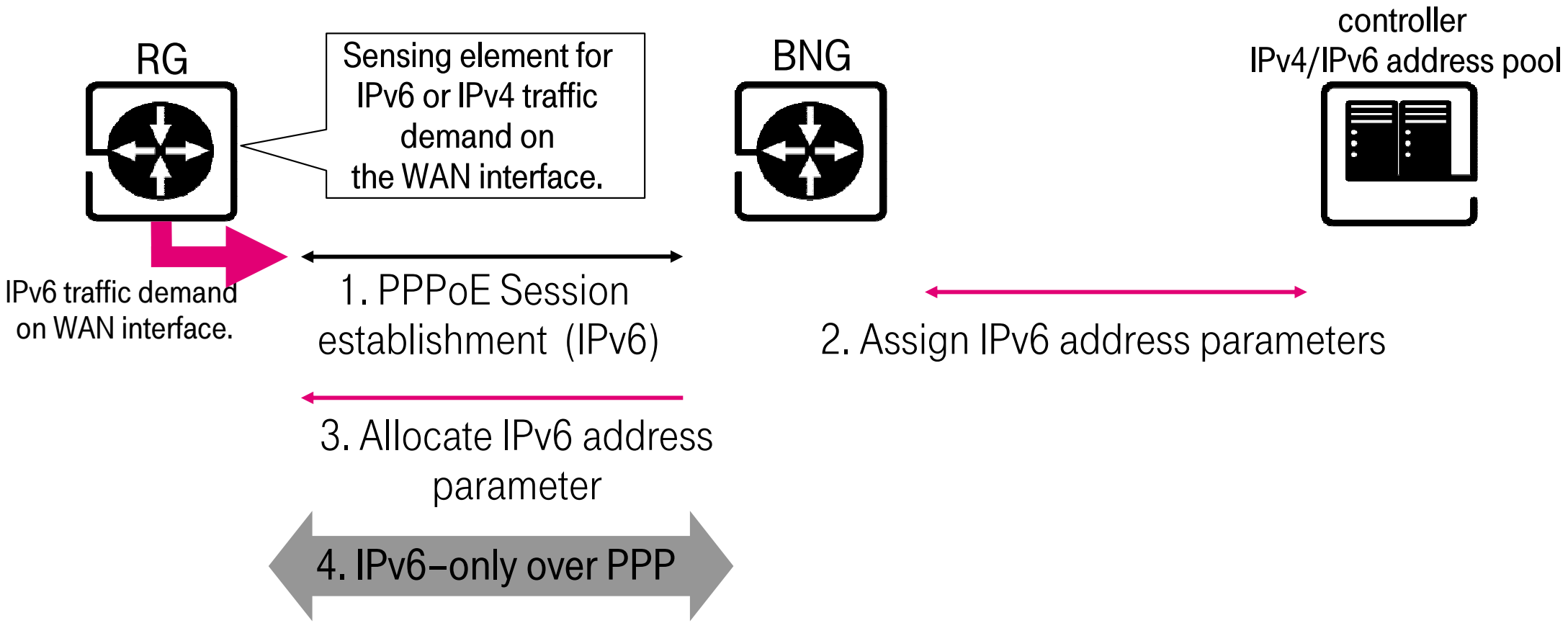
Description of Mechanism “On-demand IPv4 Address Provisioning in Dual-Stack PPP” – IP Address Usage.



- With **IPv6 usage for Always-on services** (NGN, Voice, IP-TV etc.) - IPv4 connectivity is furthermore only required for a very limited time of the day for other not yet IPv6 capable applications.
- The potential of IPv4 addresses which could be saved shall be used to avoid the implementation of more complex mechanism (e.g. NAT) as well as to minimize the impact of usability restrictions for customers.
- The IPv4 address pool size can be limited and potentially decreased.

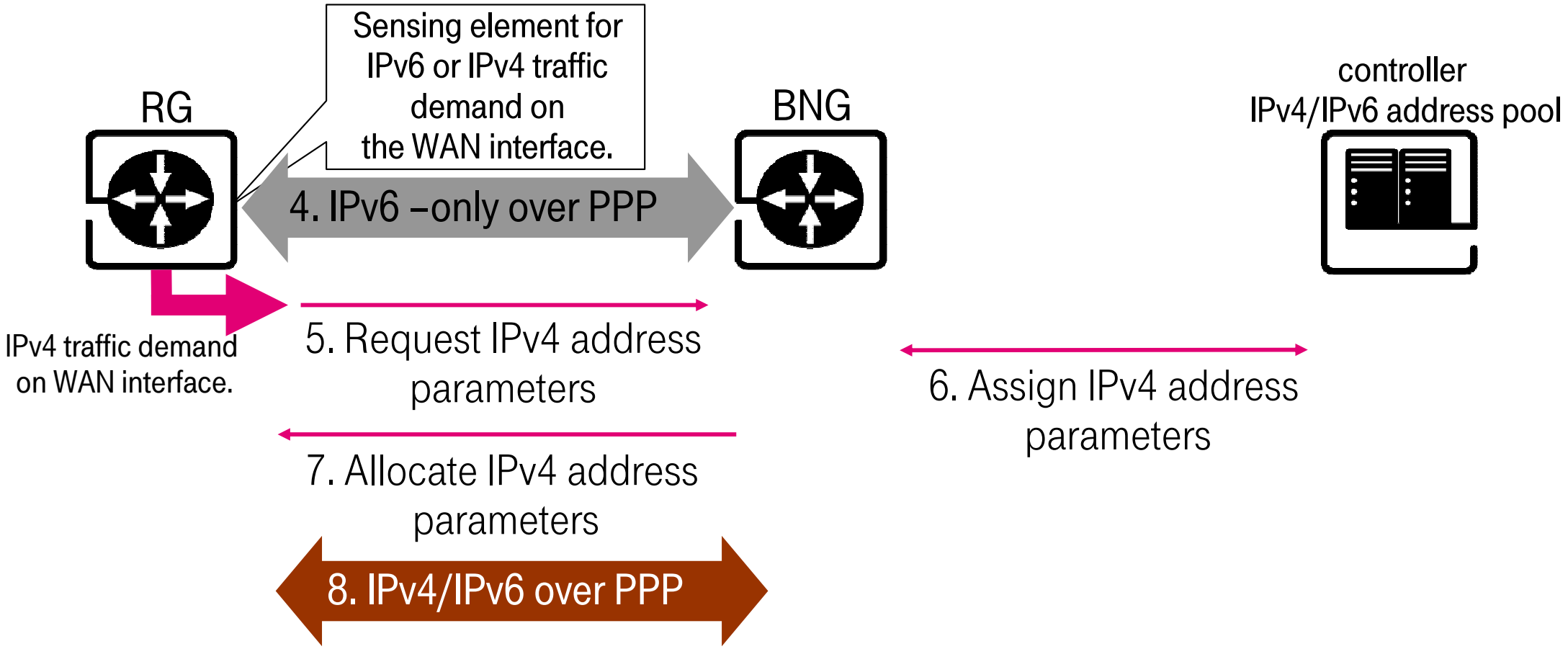
On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Description of Mechanism – IPv6-only Address parameter provisioning will be the default option.



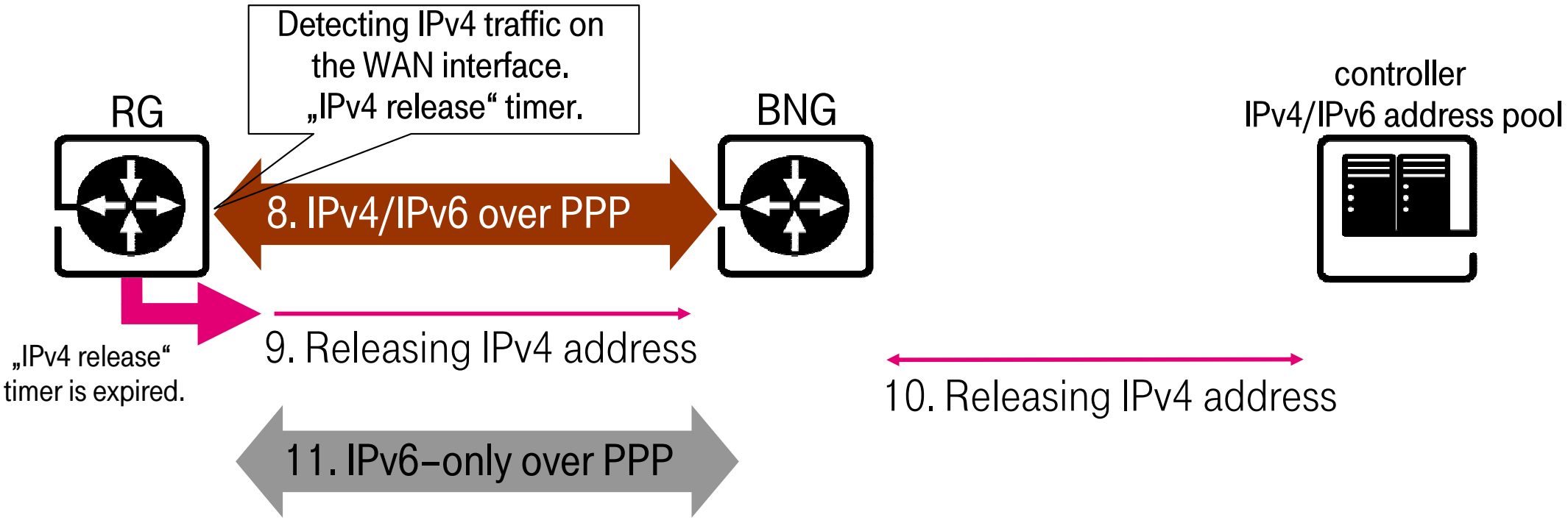
On-demand IPv4 Address Provisioning in Dual-Stack PPP.

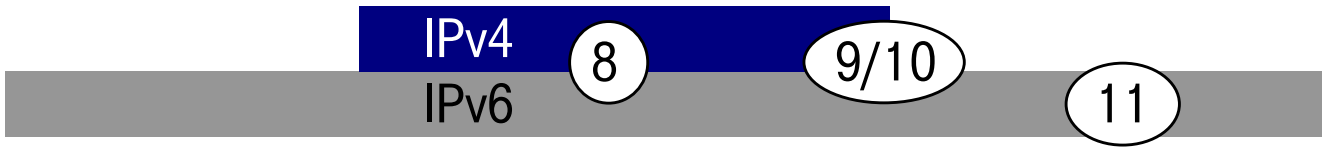
Description of Mechanism – IPv4 Address parameter can be provided on-demand.



On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Description of Mechanism – IPv4 Address parameter can be released after usage.





IP Parameters
@ RG

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Summary / Conclusion.

Summary / Conclusion

1. "On-demand IPv4 Address Provisioning in Dual-Stack PPP" can be used to right-size the IPv4 customer address pools to actual the requirements.
   - Always-on / Permanent services are produced on top of IPv6.
   - "On-demand IPv4 Address Provisioning" shows a high margin for instance in a network scenario where e.g. a VoIP customer is connected to the SP via a Dual-Stack PPP session.
   - IPv4 addresses / connectivity only temporarily needed for (few) remaining IPv4 connections.
2. Exit strategy for IPv4.
3. Used mechanisms are already described / standardized in PPP specification but not used in this context.
4. "On-demand IPv4 Address Provisioning" does not break existing implementations since IPv6 support (in HG/BNG) requires updates anyhow. Besides that standard conform implementations should already cover IPCP Termination requests in Dual-Stack sessions.

Feedback and Input highly welcome !

Thank you very much for your attention!

Questions: Try also olaf.bonness@telekom.de

Erleben, was verbindet.

Backup

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Mechanism in a nutshell.

Dynamic IPv4 Address Release

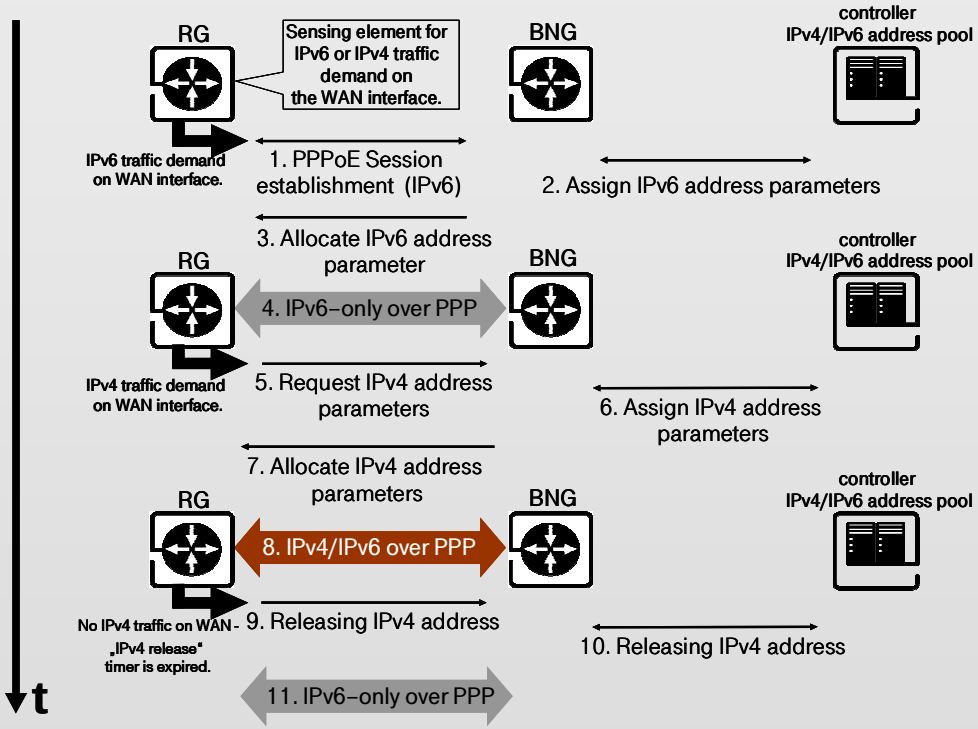
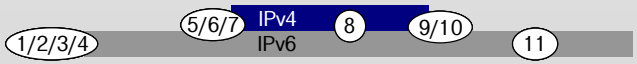


Illustration of timely usage of IP address resources:



Source: T-Home

Basic Assumptions

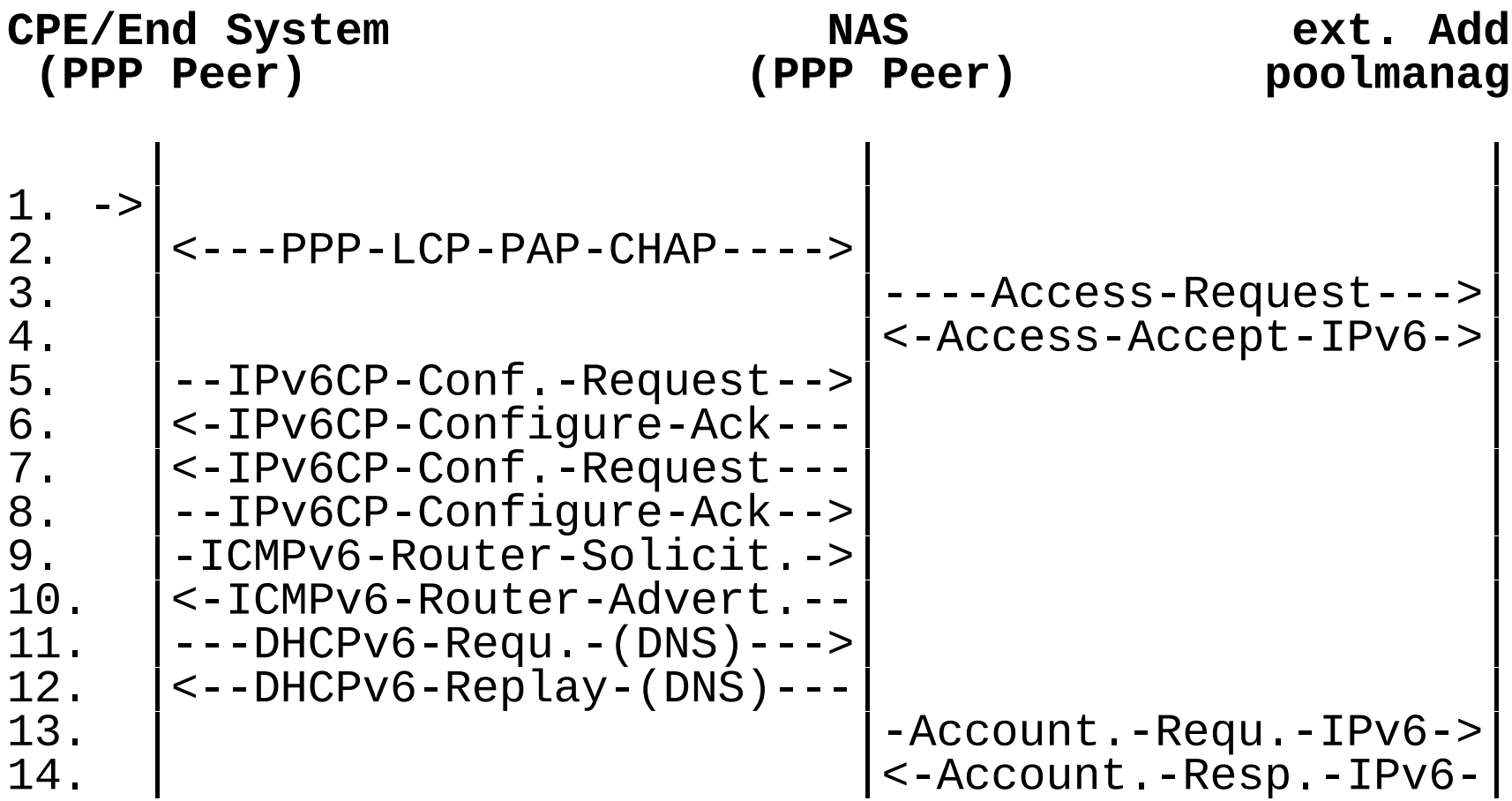
- **All long time or always-on services are produced using IPv6 –** Only few short term IPv4 connections need Internet access and addresses.
- CPE/HG releases the delegated IPv4 address after a certain inactivity time interval.
- Only the IPv6 address and prefix delegation remains on the CPE for the whole uptime.

Requirements

- E.g. **Smart Metering**, VoIP services and T-Entertain **have to be produced with IPv6** or private IPv4 addresses.
- Extensions to HG to release IPCP connection of PPP session.
- Small adaptation to IP platform steering mechanisms (e.g. Radius etc.)

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

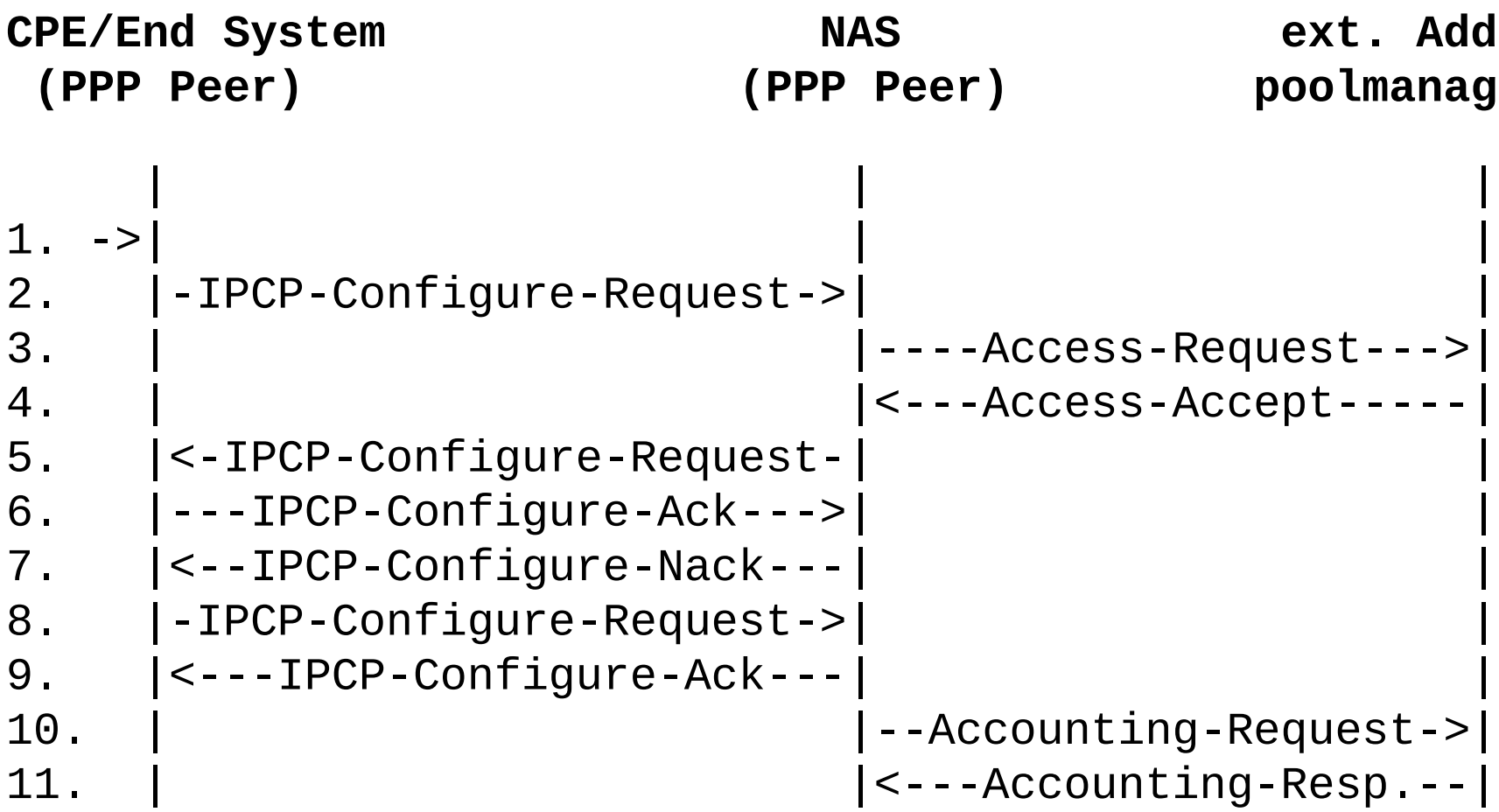
Detailed message flow 1/3.



*) The mechanism will also work when the management of the address pool is done on the NAS.

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

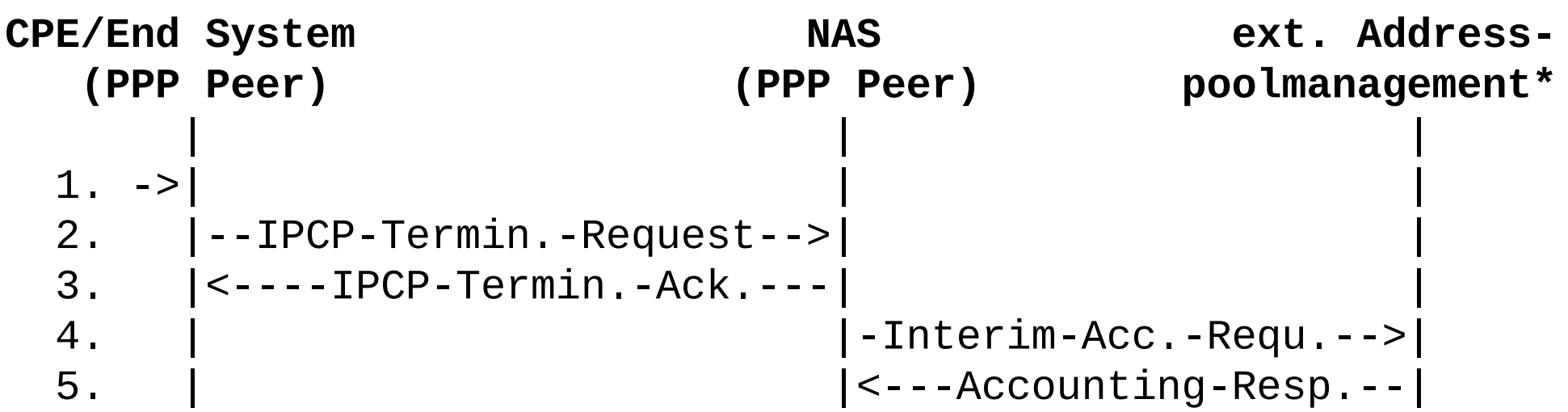
Detailed message flow 2/3.



*) The mechanism will also work when the management of the address pool is done on the NAS.

On-demand IPv4 Address Provisioning in Dual-Stack PPP.

Detailed message flow 3/3.



*) The mechanism will also work when the management of the address pool is done on the NAS.