A+P Overview

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aplusp

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Introduction

- The purpose of this presentation is to explain the main ideas of A+P
- The purpose of this presentation is NOT to provide a complete overview of all A+P proposals and use cases
- This presentation will introduce, as examples, some specific A+P implementations and use cases that are NOT meant to be the only ones possible
  - Yes we can treat some aspects differently!
A+P names & proposals

- Different names: A+P or Port Range, or SAM, or…
  - We'll be using A+P in this presentation
- A+P can be implemented in different manners and applied on different use cases
  - A+P [I-D.ymbk-aplusp]
  - Port Range [I-D.boucadair-port-range]
  - Port Range + IPv6 [boucadair-behave-ipv6-portrange]
  - SAM [I-D.despres-softwire-mesh-sam]
  - Dual IVI [I-D.xli-behave-divi]
  - ... ?
- These documents do have overlaps
A+P Overview
Today Fixed Broadband Access

PC @priv

CPE NAT @IPv4 pub

Internet
A+P: Port Range restriction

PC @priv

CPE NAT

@IPv4 pub
Port Range

Internet
A+P: Port Range restriction

Example: Port Range = [30000; 40000]
A+P: Port Range restriction

Here, PC's applications are NOT Port Range aware!!!
A+P: Port Range restriction

Here, PC's applications can be Port Range aware
A+P: Port Range restriction

Here, PC's applications are NOT Port Range aware!!!
A+P: outgoing packets
A+P: incoming packets
A+P: incoming packets

Port Range Handling of some sort

PC @priv

CPE NAT @IPv4 pub

Port Range

Internet
A+P: incoming packets

Does NOT mean IGP needs modification to take into account port information!!!
A+P solutions

- Will now discuss two ways to handle the incoming packets routing:
  - Example 1: A+P with a Port Range Router (PRR) for Fixed Broadband Access
  - Example 2: A+P with an IPv4-IPv6 Gateway for Fixed Broadband Access
Example 1: A+P with a Port Range Router (PRR) for Fixed Broadband Access
A+P with PRR

PC (@priv) -> CPE NAT (@IPv4 pub Port Range) -> PR Router -> Internet
A+P with PRR

point-to-point relationship
(encapsulation)
A+P with PRR

- PPP session; PRR in a BAS
- IPv4-in-IPv6; PRR in a DS-lite CGN
- … (encapsulation)
A+P with PRR
A+P with PRR

Federates a pool of shared addresses
A+P with PRR

Diagram:

- PC @priv
- CPE NAT
- @IPv4 pub PR
- PR Router
- Internet
A+P with PRR

Internet

Mapping Table lookup:
(@IPv4, PR) ↔ Tunnel ID
A+P with PRR

Mapping Table lookup: (@IPv4, PR) ↔ Tunnel ID
A+P with PRR

There is NOT any NAT processing in the PRR!!!

Mapping Table lookup: (@IPv4, PR) ←→ Tunnel ID
Example2: A+P with an IPv4-IPv6 Gateway for Fixed Broadband Access
A+P with IPv4-IPv6 Gateway

PC @priv

CPE NAT

IPv4 pub
Port Range

IPv6 ISP network

Internet

IPv4
A+P with IPv4-IPv6 Gateway
A+P with IPv4-IPv6 Gateway

@IPv6dest = Pref6+@IPv4+(Port)

IPv4-in-IPv6 Encap

PC @priv

CPE NAT @IPv4 pub Port Range

IPv4-IPv6 Gateway

Internet
A+P with IPv4-IPv6 Gateway

IPv6 Prefix: Pref6+@IPv4+PR allocated to the CPE

IPv4-in-IPv6 Encap
A+P with IPv4-IPv6 Gateway

Here, encapsulations are stateless (NO Mapping Table)!!!

IPv6 Prefix:
Pref6+@IPv4+PR
allocated to the CPE

@IPv4 pub
Port Range

IPv4-in-IPv6 Encap

PC
@priv

CPE
NAT

IPv4-IPv6 Gateway

Internet

@IPv6dest =
Pref6+@IPv4+(Port)
Main Points
**A+P:**

- You do NOT need and you do NOT want to modify routing protocols to take into account port information
- There is NOT any NAT in the Provider's network
- You do NOT need to make PC's applications Port Range aware
  - You may want to; if the PCs are PR-enabled, then no NAT at all!
- The amount of states is proportional to the number of users, it is not proportional to the number of on-going TCP/UDP sessions, as in CGN solutions
  - Can even rely on IPv6 stateless encapsulation
- PRR and DS-lite CGN can be co-located
Thank You