Resource Reservation Protocol for IP Transport QoS

draft-han-tsvwg-ip-transport-qos-00

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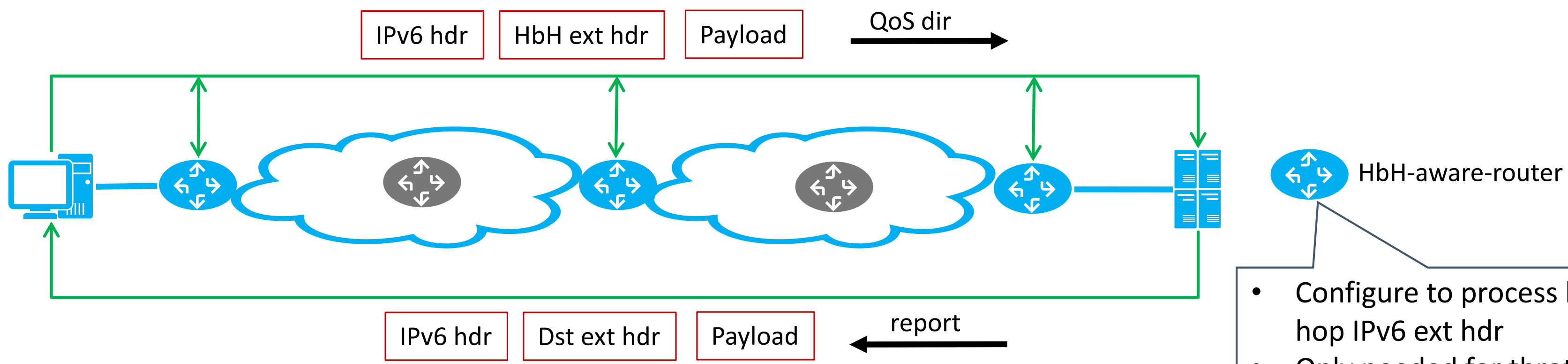
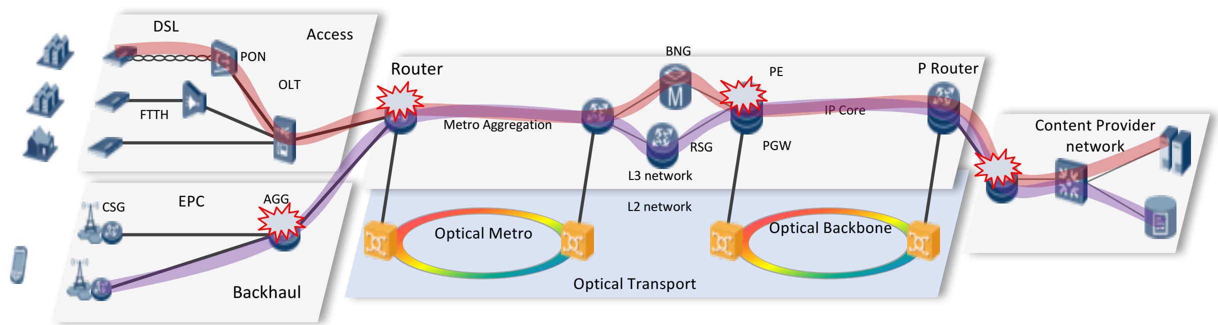
Introduction

- Presented in IETF 100. This is the re-written draft for TSVWG.
- The presentation will answer some comments and give more details.
- Objective
  A simpler/faster/more scalable resource reservation protocol to achieve Bandwidth and latency Guaranteed QoS for all IP flow(s).
- Solution
  In-band signaling through IPv6 extension header.
- Design principles
  Backward compatible, coexist with current services
  Agnostic to transport layer protocols
  Practical performance and scale targets
  Basic signaling and data security
- Scope and assumptions
  Targeted for applications that are bandwidth and/or latency sensitive
  Within one service domain
  Limited scalability requirement

How it works



- Configure to process hop-by-hop IPv6 ext hdr
- Only needed for throttle devices
- Signal processing distributed to NPU on line card
- Per flow state kept in line card
- Per flow state self-maintained by data flow, deleted if aged
- Basic security for signaling and data forwarding are provided



Scalability and Performance Analysis

- Supports both flow level QoS and aggregated flow Qos
  - Flow level
    Identified by 5 tuples: source and destination address, protocol number, source and destination port number. or 3 tuples: source and destination address, and flow label
  - Transport level
    Packets share the same source and destination address, and protocol number, e.g. TCP or UCP flows that started and terminated at the same IP addresses
  - Address Level
    Packets share the same source, destination IP address, but with different protocol number.
  - DiffServ Level
    Packets share the same DSCP value
- Only targeted to APPs that really need strict QoS service (sensitive to bandwidth and latency), not for normal APPs.
- No extra protocol, such as RSVP run by CPU. In-band signal processing is distributed in NPU on line card.
- More ports or higher throughput for a system, more NPUs are used. This means the system scalability and performance is almost not changing with the growth of the number of transport sessions.
- Scalability example
  - Industry fastest NPU - 400 G.
  - 100M/per-flow; 50 % for new TCP.
  - Maximum flows - 200 G/100 M -> 2000.

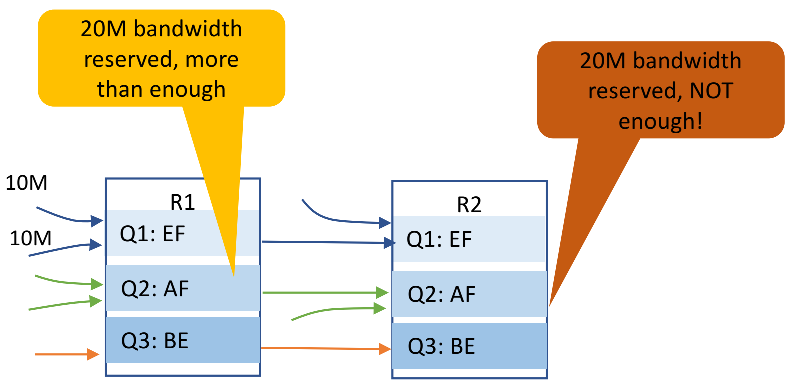
if half of the link bandwidth is allowed to new TCP, and assume the TM chip has more than 2000 queues, it can support up to **2000** new TCP session and each TCP session could have 100 M bps bandwidth.

Per-Hop Behavior DiffServ

Manual configure needed
No way to accurately know the bandwidth
Configuration example (100M interface):

```
Class-map class1
  match dscp af42
Policy-map policy1
  bandwidth percent 20
```

Bandwidth reservation is configured based on estimation

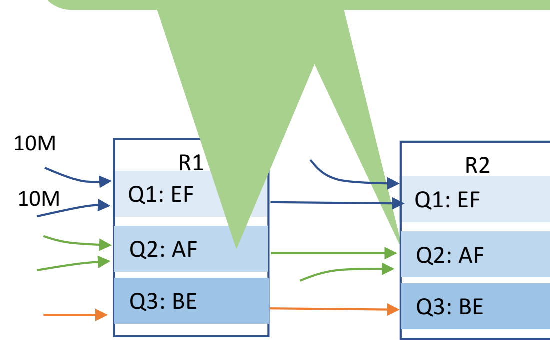


IP QoS with Resource Reservation

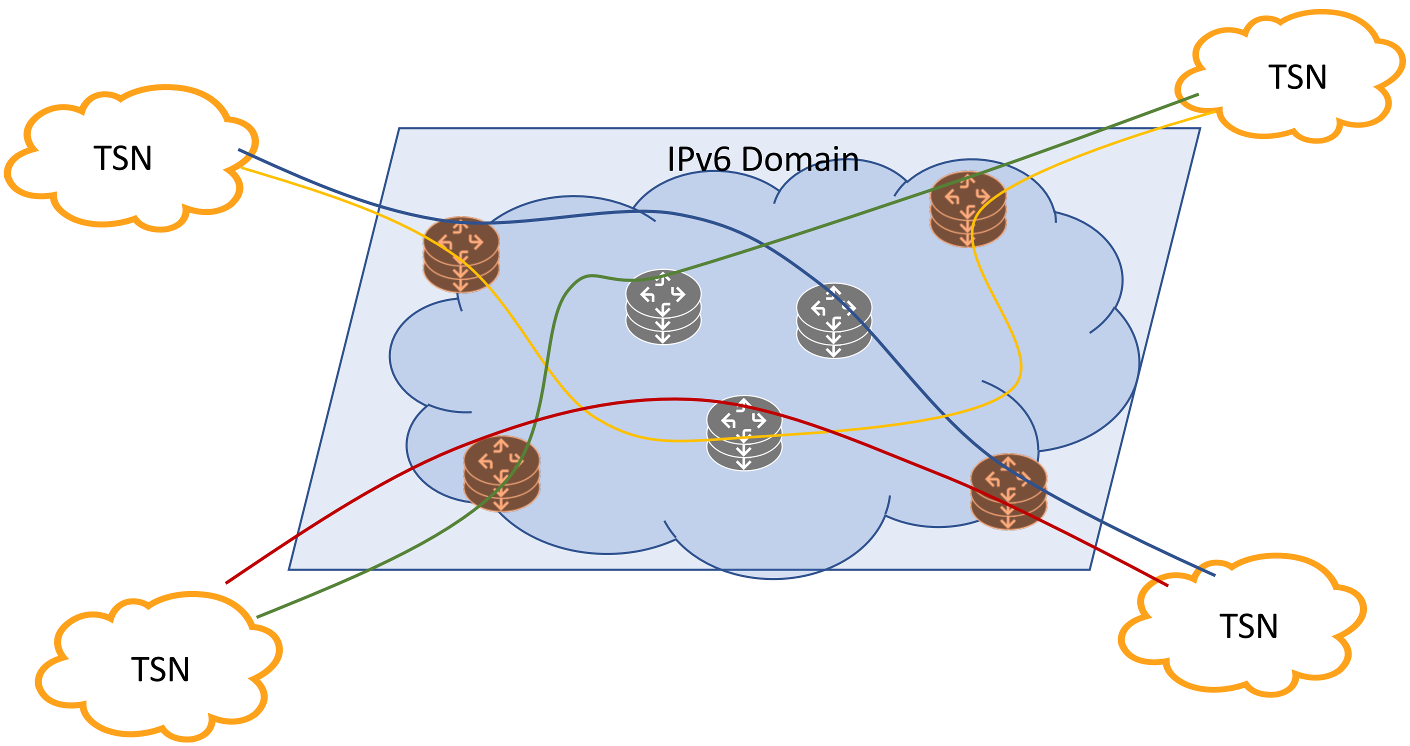
Per flow state makes it possible to have accurate QoS control for DiffServ

$$Wq = \frac{f1+f2+..fn}{B}$$

Queuing scheduling is dynamically adjusted based on flows.



Use case 1 - Detnet



TSN interconnect using IPv6:

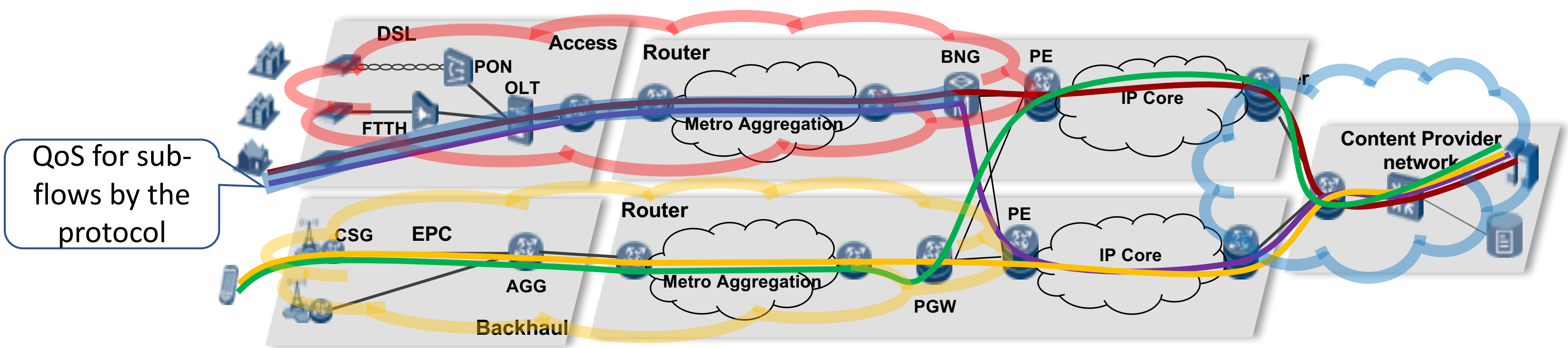
- Guaranteed bandwidth
- Guaranteed and predictable minimum per-hop-latency.
- No MPLS/LDP needed

Two possible working modes:

- Aggregated mode: Encap/decap at gateway routers, can be used to connect IPv4 networks or private address spaces
- Native mode: TSN network routes populated to IPV6 domain

Use Case 2 - PANRG

- QoS for each MPTCP sub-flow in a access network through resource reservation protocol.
- Overcome the constraint of MPTCP fairness principal (Multipath TCP should take as much capacity as TCP at a bottleneck link, no matter how many paths it is using*)*
- Integrated with multi-path in Internet to support MPTCP, and Bringing path-aware networking in current Internet that is not path-aware



Q&A

More detailed works in
ETSI NGP (Next Generation Protocol, WI#10: New transport technology):
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=52932