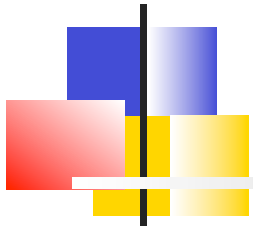
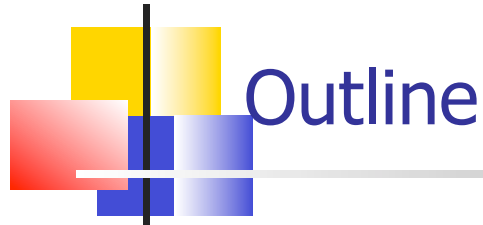


Generic Aggregation of Resource Reservation Protocol (RSVP) for IPv4 and IPv6 Reservation over PCN domains

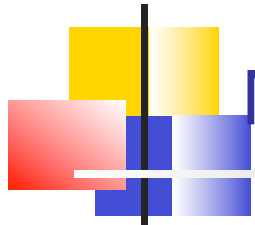


draft-karagiannis-pcn-tsvwg-rsvp-pcn-01

Georgios Karagiannis, Anurag Bhargava

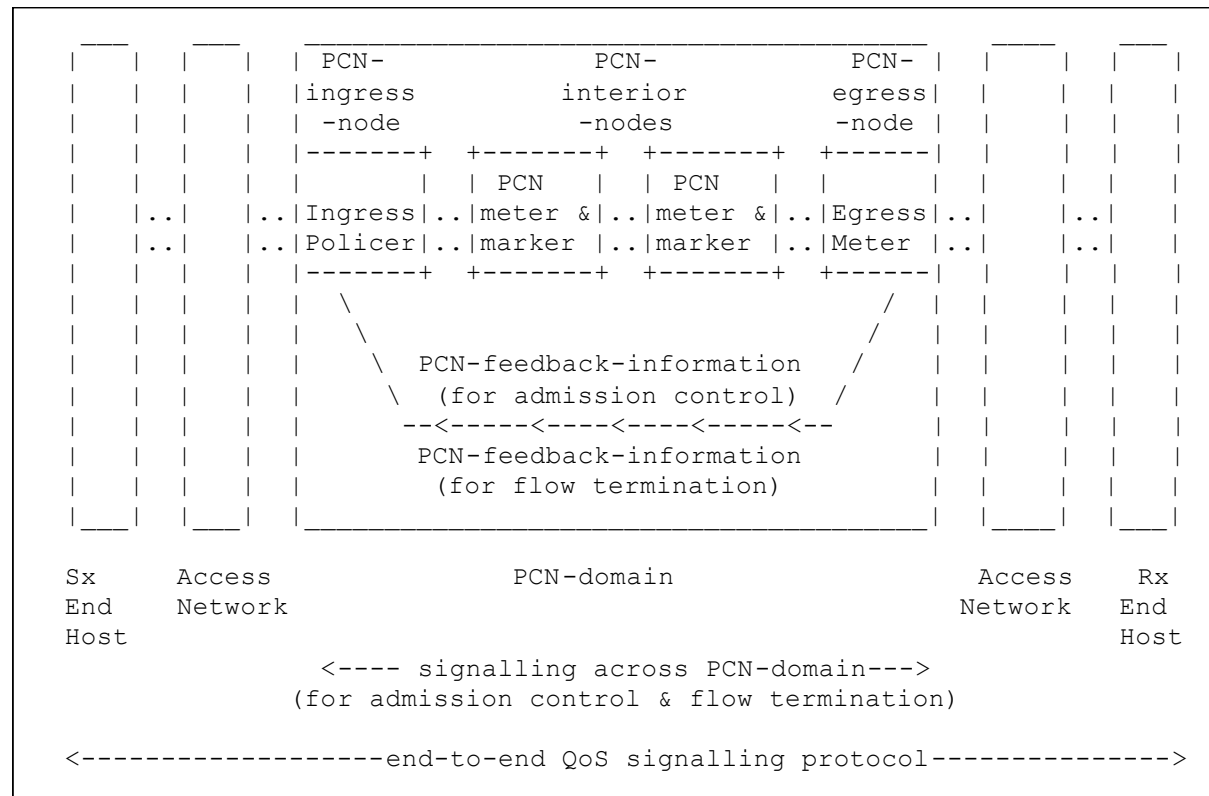


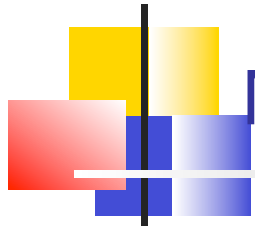
-
- Motivation
 - Main augmentations on Generic aggregated RSVP
 - Augmentations to PCN SM (Single Marking) and CL (Controlled Load) edge behavior drafts
 - Next steps
 - Examples of operation and new objects (not presented)



Motivation (1)

- PCN (Congestion and Pre-Congestion Notification) architecture (RFC 5559)





Motivation (2)

- All PCN charter items are fulfilled, except:
 - Submit Encoding and Transport of PCN from Domain Egress to Ingress to the IESG for consideration as a Proposed Standard RFC
- Pairs of PCN edge nodes use ingress-egress-aggregates (IEA):
 - Need a signaling protocol to transport PCN information from PCN-egress-node to PCN-ingress-node and to maintain ingress-egress-aggregate between each pair of PCN edge nodes



Motivation (3)

IETF QoS signaling protocols to solve problem:

- ❑ Next Steps in Signaling Protocol (NSIS) subset (RFC 5971, RFC 5974, RFC 5979)
- ❑ Aggregation of RSVP for IPv4 and IPv6 Reservations (RFC3175)
- ❑ Generic Aggregate Resource ReSerVation Protocol (RSVP) Reservations (RFC4860)

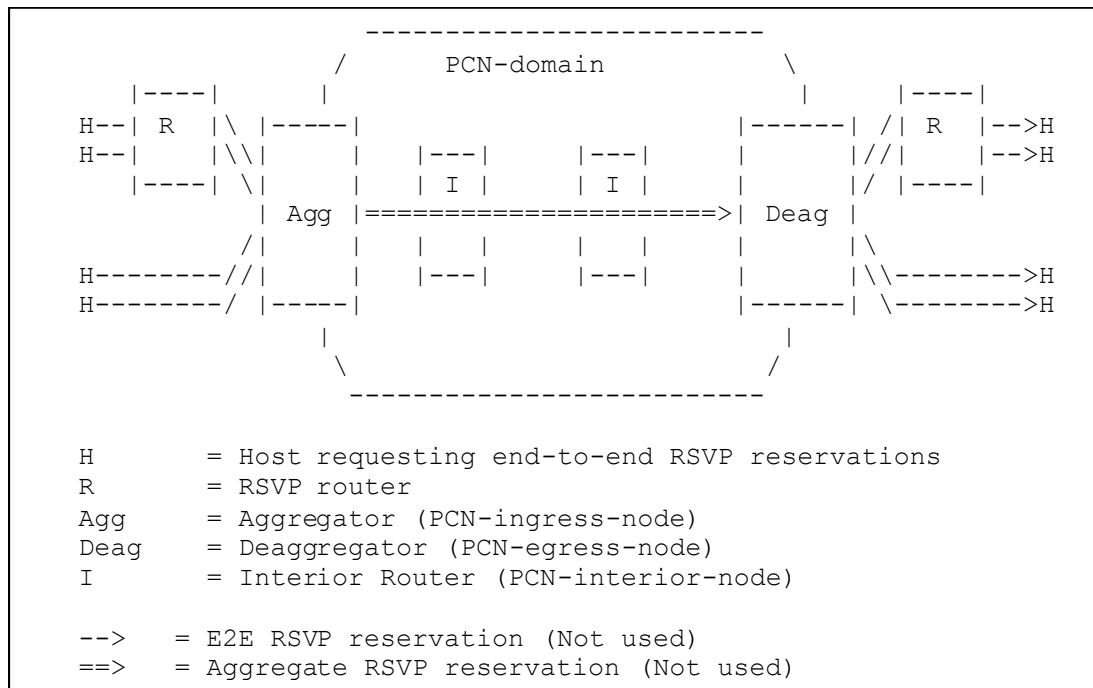
All can be used, but for time being selected RFC 4860 due:

- ❑ possible deployment interest
- ❑ supports RFC 3175 and additional features such as:
 - support of multiple IEAs from same pair of PCN edge nodes
 - support of bandwidth reduction for individual flows (RFC 4495)

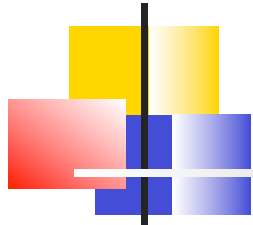


Motivation (4)

- Generic Aggregation of Resource Reservation Protocol (RSVP) for IPv4 and IPv6 Reservation over PCN domains architecture

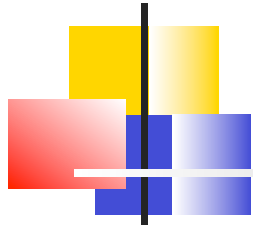


Main augmentations on Generic aggregated RSVP (1)



- Four new (2 for CL and 2 for SM) objects specified to include PCN information to be transported from PCN-egress-node (Deaggregator) to PCN-ingress-node (Aggregator)
- Support policies to initiate/maintain for each combination of PCN edge node and each of other PCN edge nodes one RSVP SESSION for generic aggregated reservations
 - RSVP SESSION for generic aggregated reservations can match to one or more than one IEAs (between a pair of PCN edge nodes)
- For each IEA, a PCN-egress-node, periodically generates Aggregated Resv messages and include new PCN object
- PCN-interior-nodes are not using E2E RSVP or Generic Aggregated RSVP messages, but treat them as normal packets.

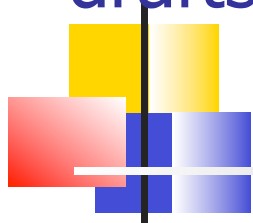
Main augmentations on Generic aggregated RSVP (2)



- E2E RSVP session admission in PCN-domain:
 - each Aggregator support policies and PCN functionalities to admit or reject incoming e2e RSVP Path message & send a PathErr towards sender

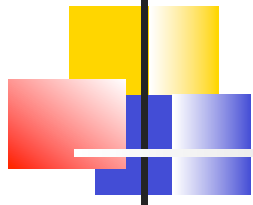
- E2E RSVP flow termination in PCN-domain:
 - each Aggregator support policies and PCN functionalities for initiation:
 - ❖ termination of one or more active E2E RSVP sessions
 - ❖ reduce bandwidth of one or more active individual existing RSVP sessions, in order to solve congestion in PCN-domain
 - same mechanisms for terminating or reducing bandwidth of an e2e RSVP session, as specified in [RFC4495]

Augmentations to PCN SM and CL edge behavior drafts (1)

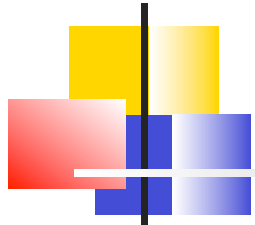


- Considered that PCN-ingress-node collocated with Decision point
- More than one IEAs between same pair of PCN edge nodes should be supported, each of them using a different PHB-ID value
- When IEA supported by a PCN-ingress-node is in PCN-admission state, then based on local policy, requesting e2e RSVP session should be:
 - rejected
 - mapped to another IEA that NOT in PCN-admission-state

Augmentations to PCN SM and CL edge behavior drafts (2)

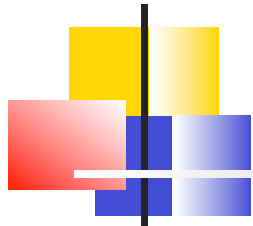


- When for IEA supported by PCN-ingress-node incoming traffic needs reduced then based on a local policy and for same IEA, selects a number of e2e RSVP sessions to be:
 - terminated
 - reduce reserved bandwidth of e2e RSVP sessions, in order to solve congestion in PCN-domain



Next steps

- We ask the support of the PCN WG or TSVWG such that this draft becomes either a PCN WG and/or a TSVWG working group draft



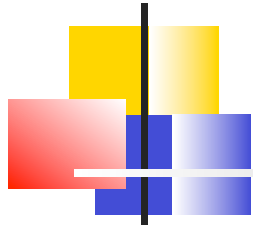
Examples of operation and new objects

Controlled (CL) PCN object, IPv4 addresses are used:

```
Class = PCN
C-Type = RSVP-AGGREGATE-IPv4-PCN-CL
+-----+-----+-----+-----+
| IPv4 PCN-ingress-node Address (4 bytes) |
+-----+-----+-----+-----+
| IPv4 PCN-egress-node Address (4 bytes) |
+-----+-----+-----+-----+
| Congestion-Level-Estimate |
+-----+-----+-----+-----+
| rate of not marked PCN-traffic (NM-rate) |
+-----+-----+-----+-----+
| rate of threshold-marked PCN-traffic (ThM-rate) |
+-----+-----+-----+-----+
| rate of excess-traffic-marked PCN-traffic (ETM-rate) |
+-----+-----+-----+-----+
```

Controlled (CL) PCN object, IPv6 addresses are used:

```
Class = PCN
C-Type = RSVP-AGGREGATE-IPv6-PCN-CL
+-----+-----+-----+-----+
| IPv6 PCN-ingress-node Address (16 bytes) |
+-----+-----+-----+-----+
| IPv6 PCN-egress-node Address (16 bytes) |
+-----+-----+-----+-----+
| Congestion-Level-Estimate |
+-----+-----+-----+-----+
| rate of not marked PCN-traffic (NM-rate) |
+-----+-----+-----+-----+
| rate of threshold-marked PCN-traffic (ThM-rate) |
+-----+-----+-----+-----+
| rate of excess-traffic-marked PCN-traffic (ETM-rate) |
+-----+-----+-----+-----+
```



Examples of operation and new objects

Single Marking (SM) PCN object, when IPv4 addresses are used:

Class = PCN

C-Type = RSVP-AGGREGATE-IPv4-PCN-SM

```
+-----+-----+-----+-----+
| IPv4 PCN-ingress-node Address (4 bytes) |
+-----+-----+-----+-----+
| IPv4 PCN-egress-node Address (4 bytes) |
+-----+-----+-----+-----+
| Congestion-Level-Estimate |
+-----+-----+-----+-----+
| rate of not marked PCN-traffic (NM-rate) |
+-----+-----+-----+-----+
| rate of PCN-marked PCN-traffic (PM-rate) |
+-----+-----+-----+-----+
```

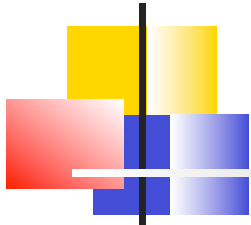
Single Marking (SM) PCN object, when IPv6 addresses are used:

Class = PCN

C-Type = RSVP-AGGREGATE-IPv6-PCN-SM

```
+-----+-----+-----+-----+
|
+
| IPv6 PCN-ingress-node Address (16 bytes) |
+
+
+-----+-----+-----+-----+
|
+
| IPv6 PCN-egress-node Address (16 bytes) |
+
+
+-----+-----+-----+-----+
| Congestion-Level-Estimate |
+-----+-----+-----+-----+
| rate of not marked PCN-traffic (NM-rate) |
+-----+-----+-----+-----+
| rate of PCN-marked PCN-traffic (PM-rate) |
+-----+-----+-----+-----+
```

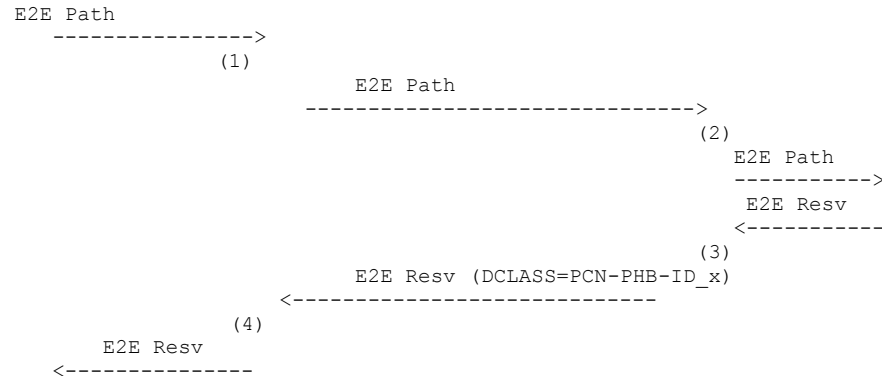
Examples of operation and new objects



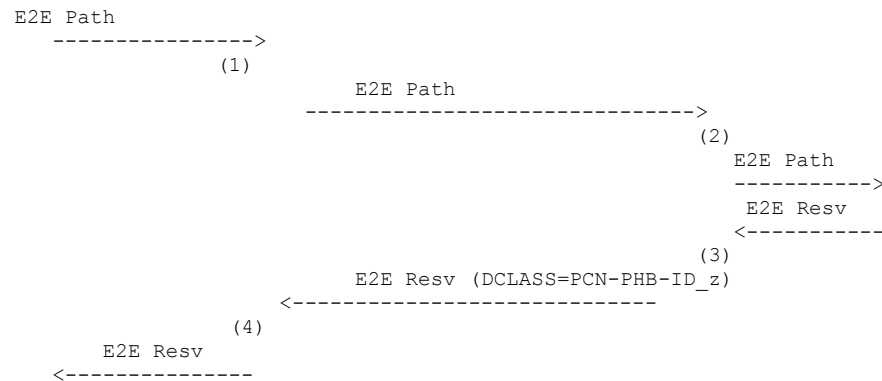
PCN Admission control

Consider: multiple (two) Aggregate Paths and IEA exists for same ingress-egress pair, e.g.,: (1) IEA associated with PCN-PHB-ID_x and (2) IEA with PCN-PHB-ID_z

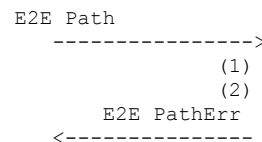
IEA with PCN-PHB-ID_x NOT in PCN-admission-state



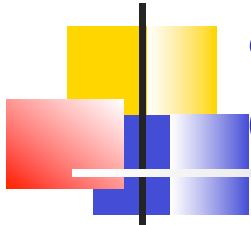
IEA with PCN-PHB-ID_x in PCN-admission state and IEA with PCN-PHB-ID_z NOT in PCN-admission-state



IEA with PCN-PHB-ID_x in PCN-admission state and IEA with PCN-PHB-ID_z in PCN-admission-state



Examples of operation and new objects



Flow termination

Consider: PCN-ingress-node SHOULD reduce A amount traffic coming into IEA with DCLASS=PCN-Diffserv_x

Policy in PCN-ingress defines that E2E flows associated with this IEA SHOULD be terminated (terminate number E2E Flows to reduce A amount traffic coming into IEA)

```
(1)
  AggResv (Session=GAx)
<-----
(2)
  AggResvConfirm (Session=GAx)
----->

(3)
  E2E ResvTear
<-----
  E2E ResvTear
<-----
  E2E ResvTear
<-----
```

Policy in PCN-ingress defines that some E2E flows associated with this IEA SHOULD be terminated and reduce bandwidth for some other individual flows associated with same IEA (terminate number E2E Flows to reduce A amount traffic coming into IEA)

```
(1)
  AggResv (Session=GAx)
<-----
(2)
  AggResvConfirm (Session=GAx)
----->

(3)
```

[use RFC4495 to reduce bandwidth for some individual flows associated with IEA and terminate some other individual flows associated with same IEA]