Guidelines for Adding Congestion Notification to Protocols that Encapsulate IP

draft-briscoe-tsvwg-ecn-encap-guidelines-04

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aim of this draft

- guidelines for writing specs to propagate ECN up to IP from:
  - L2 protocols (e.g. IEEE802, TRILL)
  - tunnelling protocols (L2TP, PPTP, GRE, VXLAN, GTP,…)
- for authors who may not be ECN experts
- scope: wire protocol, not algorithms

draft status

- intended status: best current practice
- individual draft-04, **ready for WG adoption**

ECN = explicit congestion notification
L2TP = layer 2 tunnelling protocol [RFC2661]
PPTP = Point-to-point Tunnelling Protocol [RFC2637]
GRE = generic routing encapsulation [RFC1701, RFC2784]
QCN = quantised congestion notification [IEEE 802.1Qau]
GTP = GPRS tunnelling protocol [3GPP TS 29.060]

context / problem

- urgency due to growing interest in ECN again
  - in recognition of the importance of low delay
  - particularly in L2 networks (backhaul, data centres) & mobile
- AQM & ECN are for queues at any layer
  - not just IP
- ECN has to be explicitly propagated
  - up the layers
- in contrast drop is easy
  - it naturally propagates up the layers

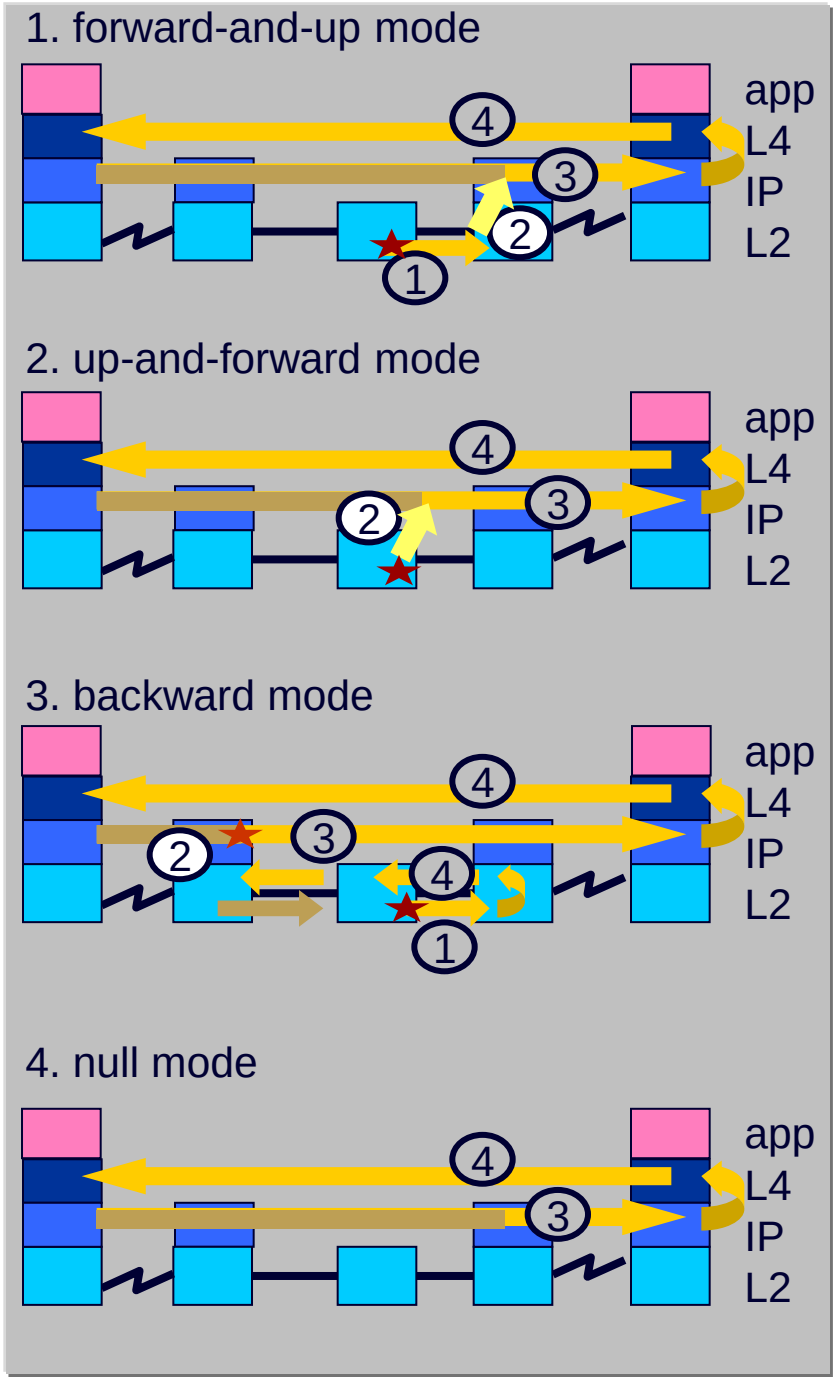
AQM = active queue management (e.g. RED, CoDel, PIE, DCTCP threshold, PCN)

a variety of arrangements

- avoid precluding L2 innovation
- must not be over-prescriptive

- guidelines for each mode
  - see draft (or spare slides)

- wide expertise needed for authoring & review



how would this draft BCP be used?

- authors of L2 & tunnel protocols often not L4 experts
- for IETF maintained protocols, e.g.
  - TRILL, L2TP, PPTP, GRE, VXLAN (in INTAREA, NVO3, ...)
  - they can be referred to this draft BCP (e.g. by IESG)
- for protocols maintained by other SDOs*
  - while considering this for BCP, and once issued as a BCP IAB would issue liaisons, e.g.
    - to IEEE for 802 protocols
    - to 3GPP for GTP, E-UTRAN
    - etc.

- summary: given ECN has changed IP
  - this doc sets requirements for interfacing these protocols with the new IP

this has become urgent

* SDO = Standards Developing Organisations

new in draft-04

Technical

- §5 Feed up and forward mode:
  - Added 3GPP eNodeB case, given Evolved UTRAN TS 36.300 now requires ECN marking
  - Section was previously devoted to Ethernet

Editorial

- Rearranged Introduction
  - to motivate ECN after motivating cross-layer propagation

Document is already fairly mature

Open Issues

recorded in Appendix A

- How to update all the standards track tunnelling protocols:
  - Consider whether an IETF Standard Track doc(s) will be needed to Update the IP-in-IP protocols listed in Section 4.1 – at least those that the IETF controls – and which Area/WG it should sit under.
  - [JT] “INT area not even motivated by wider tunnelling recommendations”
    - *Proposed approach: BCP ECN-specific guidelines in tsvwg, plus a proposed standard RFC on tunnels (INT Area + NVO3 cross-review)*
- Outstanding from previous reviews:
  - [GF] “Certain guidelines warrant MUST (NOT) rather than SHOULD (NOT). Esp:
    - If inner is a Not-ECN-PDU and Outer is CE (or highest severity congestion level), MUST (not SHOULD) drop?”
    - *Proposed approach: Express overall intent, not just decap, as MUST (NOT)*
- Double check: should intended status be BCP or INF?
  - *Proposed approach: Contains normative statements and extrapolates approach in IP-in-IP and MPLS proposed standards, so BCP not just INF seems correct?*

next steps - process

- chairs to request adoption onto tsvwg agenda
- thanks to those volunteering to review, so far:
  - Andrew McGregor
  - Wei Xinpeng
  - Richard Scheffenegger
  - Dirk Kutscher
  - Ingemar Johansson
  - (already Gorry Fairhurst reviewed draft-01 & draft-03 Intro)
- and thanks for 14+ expressions of support for adoption on list

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Q&A

& spare slides

status of congestion notification
in protocols that encapsulate IP

- IETF

  done: MPLS-in-MPLS, IP-in-MPLS [RFC5129], IP-in-IP [RFC6040]

  to do: trill-rbridge-options (in progress),
  & pass ECN thru tunnel protocols, eg. L2TP PPTP, GRE, VXLAN

- Other standards bodies:

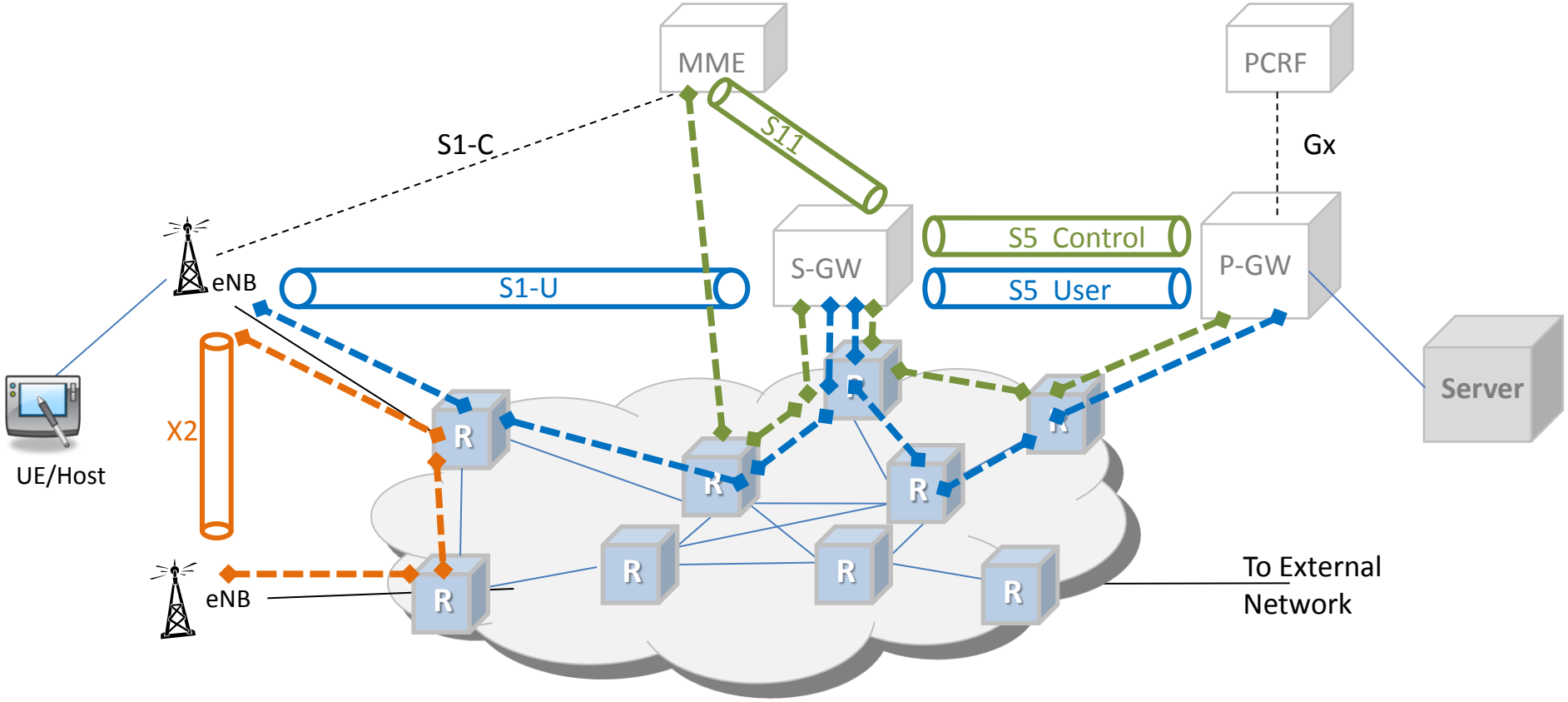
  done: QCN [802.1Qau], Frame Relay, ATM [I.371]
  (all subnet-local)

  todo: IEEE 802.1, (802.3, 802.11), …?
  & pass ECN thru tunnel protocols, eg. 3GPP GTP

L2TP = layer 2 tunnelling protocol [RFC2661]
GRE = generic routing encapsulation [RFC1701, RFC2784]
QCN = quantised congestion notification
GTP = GPRS tunnelling protocol - user plane [3GPP TS 29.281]

motivating example

3GPP LTE/SAE – sequence of tunnels

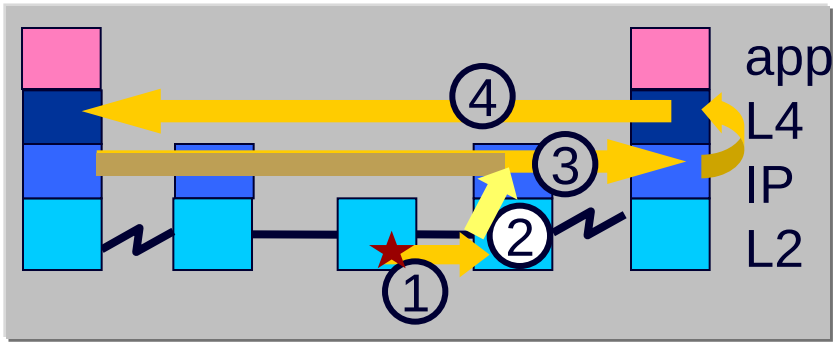


More than 1 tunnel between policy enforcement points.

Example: UE PDN connection traverses

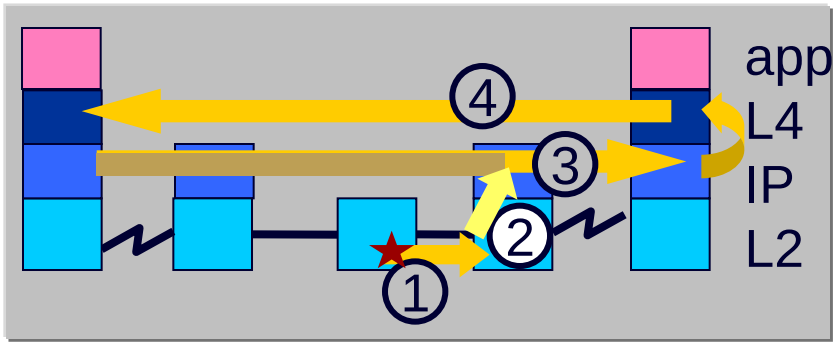
[eNB] << S1-U >> [SGW] << S5/S8 >> [PGW].

forward and upward mode: requirements



- identifying whether transport will understand ECN
- identifying whether egress will understand ECN
- propagating ECN on encapsulation
- propagating ECN on decapsulation
- reframing issues

forward and upward mode: guidelines



- identifying whether transport will understand ECN
  - ‘ECN-capable transport’ codepoint or other approaches
- identifying whether egress will understand ECN
  - new problem
- propagating ECN on encapsulation
  - copying ECN down for monitoring purposes
- propagating ECN on decapsulation
  - combining inner & outer
- reframing issues
  - marked bytes in ≈ marked bytes out
  - timeliness – don’t hold back any remainder

the main problem: incremental deployment

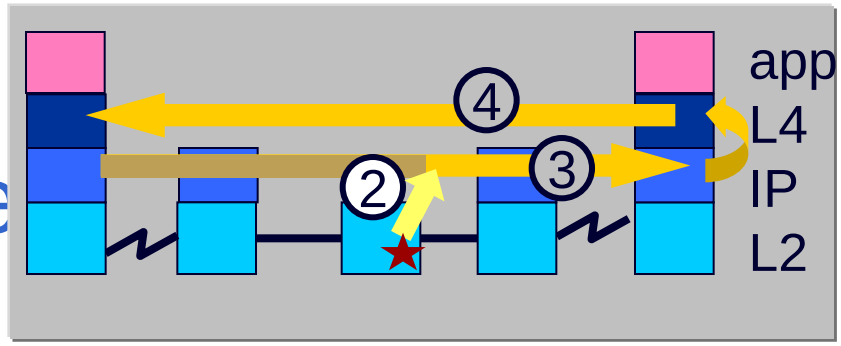
- IP-ECN designed for incremental deployment

		congested queue supports ECN?	
transport supports ECN?	IP header	N	Y
N	Not-ECT	drop	drop
Y	ECT	drop	CE

- if transport only understands drop
  - lower layer must not send it congestion indications
- need not mimic IP mechanism (grey)
  - but needs to achieve same outcome (white)
  - also, must check egress understands ECN too

ECT = ECN-capable transport
CE = Congestion Experienced

up and forward mode guidelines

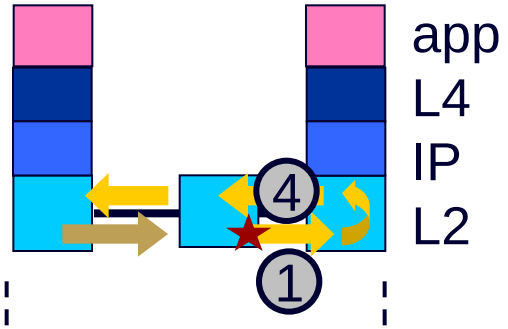


- identifying whether transport will understand ECN
  - use IP mechanism
- ~~identifying whether egress will understand ECN~~
- ~~propagating ECN on encapsulation~~
- ~~propagating ECN on decapsulation~~
- ~~reframing issues~~
- a layering violation
  - but safe if guidelines apply

backward mode

IEEE 802.1Qau (QCN)
ATM ITU-T-I.371
Frame Relay

- often designed for where the subnet is the whole network



- doesn't interwork efficiently with IP's forwards-only mode