

# Stateless Bounded Latency for DetNet MPLS Data Plane

draft-eckert-detnet-mpls-tc-tcqf-01

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# Why ?

(Authors) We need IETF/(DetNet) standardized bounded latency specification – for large-scale/high-speed nets  
“Existing” (proven/”standardized”) / applicable solutions ?

Per-hop, per-flow regulation: A.1) RFC2212 (GS)      A.2) TSN-ATS

Needs DetNet YANG model(s) ?! (no known draft submissions ?)

RSVP ? RFC2210, RSVP (GS) or draft-trossen-detnet-rsvp-tsn (TSN-ATS)

## Limitations

*Draft-liu-detnet-large-scale-requirements*

*more details:draft-eckert-detnet-bounded-latency-problems/*

- I. Insufficient for applications: Have large(est) jitter (of all bounded latency solutions).
  - May lead to requiring (PTP) clock-sync support on all (small IoT) application devices
  - May lead to network size dependent buffer requirements on application devices
- II. Expensive/scalability limit for wide-area/large-scale (Service Provider) DetNet services (per-hop-state)
- III. Non-applicable to desirable stateless forwarding planes: (Future – not yet in DetNet scope ?!)
  - SR-MPLS/SRv6 (unicast), BIER/... (multicast)

# How ?

## TSN “Cyclic Queuing and Forwarding” (P802.1Qch)

Solves problems I. (low jitter), III. (stateless), but does not work for high-speed or WAN:

Cycles on adjacent nodes matched by synchronized clock:

Link propagation latency and jitter must be  $\ll$  cycle time.

PTP clock accuracy linear with speed of links. Works today up to ?! 10 Gbps only.

## Tagged Cyclic Queuing and Forwarding (TCQF)

Solves high-speed, WAN-link issues by carrying cycle-ID in appropriate packet header field

IEEE targeted LAN use-case with CQF, not required there

Pre-standard implemented by vendor in WAN router  
at  $\geq$  100 Gbps interfaces, 2000 mile network

# TCQF High Level

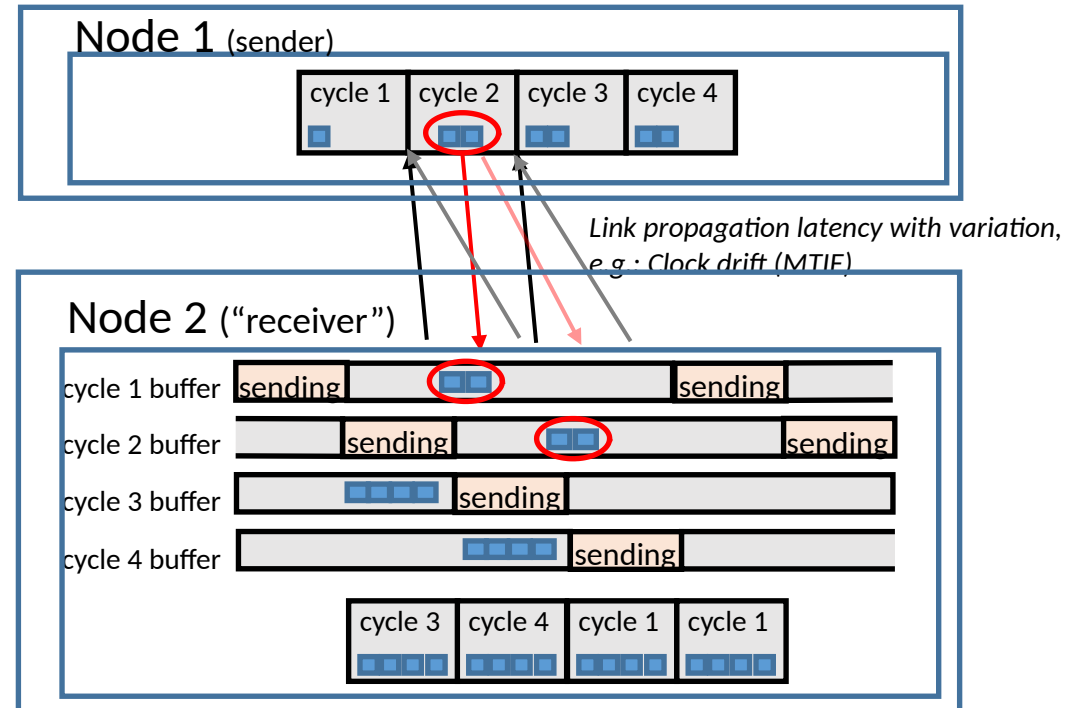
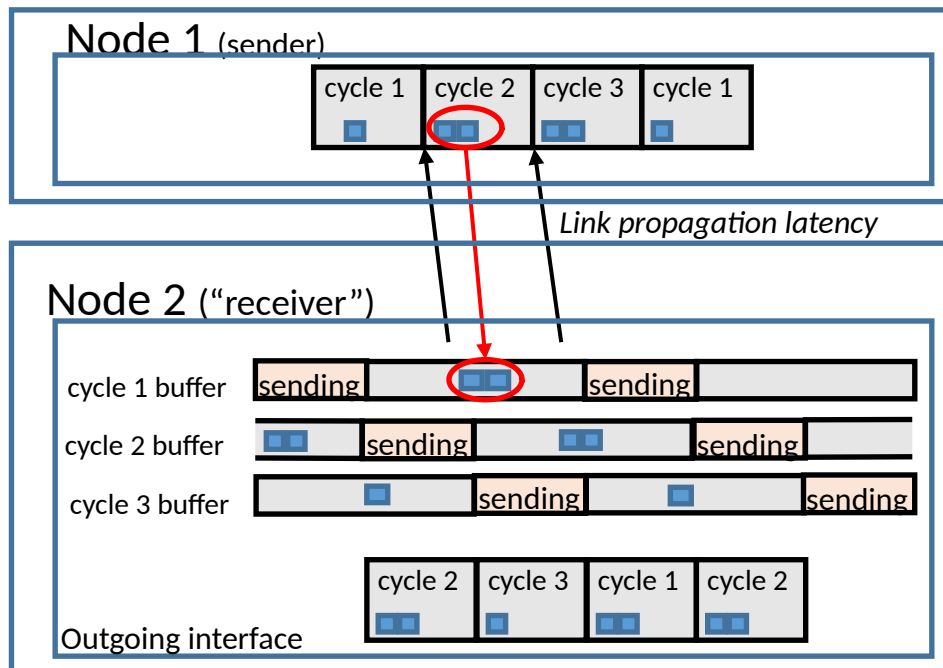
With 3 cycles used, arbitrary latency links can be supported

Every node has cycle-mapping table from prior hop (calculated by controller)

Clock accuracy: “Maximum Time Interval Error” (MTIE) < 90% cycle time

With 3 or more cycles, additional inaccuracies can be compensated

e.g.: link propagation variation (jitter) and/or higher MTIE



# Proposal / ask to DetNet WG

draft-eckert-detnet-mpls-tc-tcwf

Proposes standard TCWF mechanism (including per-hop state machinery)

Hops can have different taggings (MPLS, IP,...)

Proposes standard MPLS tagging via Traffic Class field (TC)

No change in forwarding/encap required. Just use of RFC3270 (MPLS DiffServ)

Easiest to operationalize TCWF option

Matches current DetNet approach “one complete Data-Plane first” via MPLS

Hereby asking DetNet to adopt this work

# Adjacent work

## YANG model to configure TCQF tagging/mapping-tables

*Author(s) happy to work on that if TCQF work is adopted  
(YANG expert co-authors very much welcome)*

### Ingres policer/tagger

Per-flow/per-packet operation. Open to discuss where this should go:

Could be open work item for TC-TCQF draft

Or separate draft: Ingres policer also required/beneficial for any other DetNet option

### Tagging for other data-planes

IP(v4)/IPv6 DSCP: Discuss with TSVWG (require few DSCP per hop)

Except for DSCP policy discuss, simple “extension”/”update” to TCQF

### SRv6

Could design SRH style source steering to void per-hop mapping table

Unclear if desired (old draft exists). Could be an option for SRH compression

The End