Problem Statement

of Queuing Mechanism with Multiple Cyclic Buffers

draft-dang-queuing-with-multiple-cyclic-buffers-00

Bryan Liu (liubingyang@huawei.com)

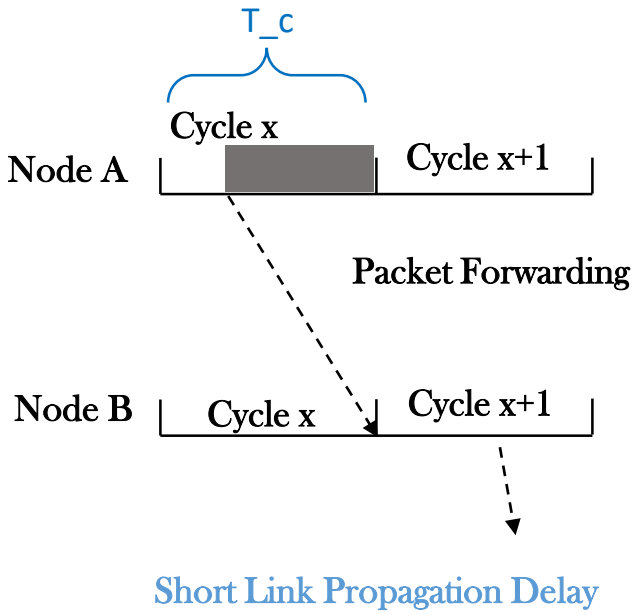
Joanna Dang (dangjuanna@huawei.com)

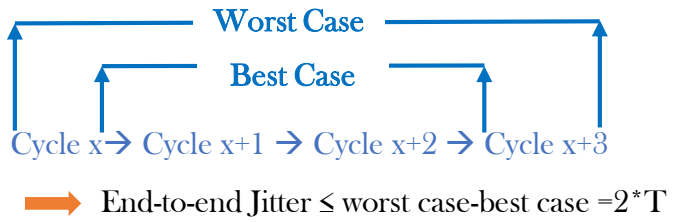
IETF-110 : March 2021, Online (in virtual Prague)

A reminder to new attendees …

- DetNet is about an upper bound on end-to-end latency – not low average latency.
- Bounded latency is the ability for IETF Deterministic Networking (DetNet) or IEEE 802.1 Time-Sensitive Networking to compute exactly how many buffers are required to achieve zero congestion loss.
- draft-ietf-detnet-bounded-latency describes requirements for queuing mechanisms of Cyclic Queuing and Forwarding (IEEE8021Q). For a given DetNet class of service, a set of two or more buffers is provided at the output queue layer.

2-buffer CQF





2-buffer CQF has been defined in IEEE 802.1 Qch (TSN-CQF)

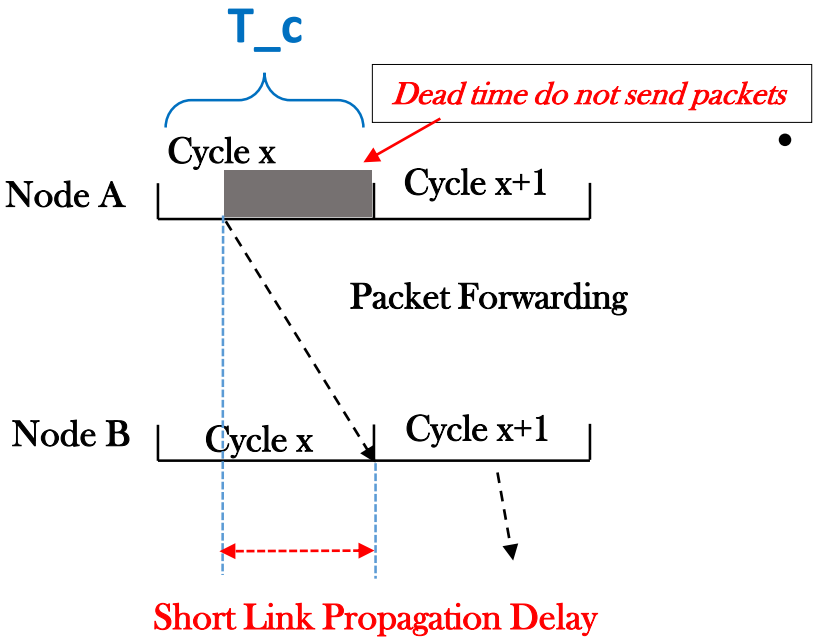
Introduction： Two buffers per outport.

- That link propagation delay should be absorbed by a cycle.
- The cycle buffer dead time is used to identify different cycle.

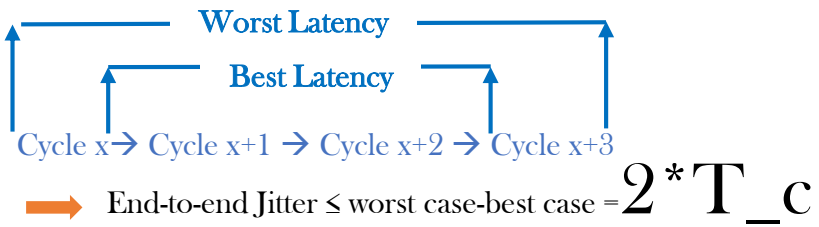
For example

The packets sent by up-stream node (e.g., A) at cycle x must be received by node B at the same cycle.

Problem Statement of 2-buffer CQF



- **Dead time wastes bandwidth resources.**
  - When the method is applicable, the sum of link delay, output delay, preemption delay and processing delay takes a portion of T_c, called dead time in [draft-ietf-detnet-bounded-latency], which cannot be used to send packets with deterministic services.
- **Prohibit the method from being used with long links, such as in WAN and MAN scenarios.**
  - The link propagation delay must be smaller than the T_c. the link propagation delay must be smaller than the T_c. Therefore, T_c must be larger than the link delay, resulting in high latency, jitter and buffer upper bound.

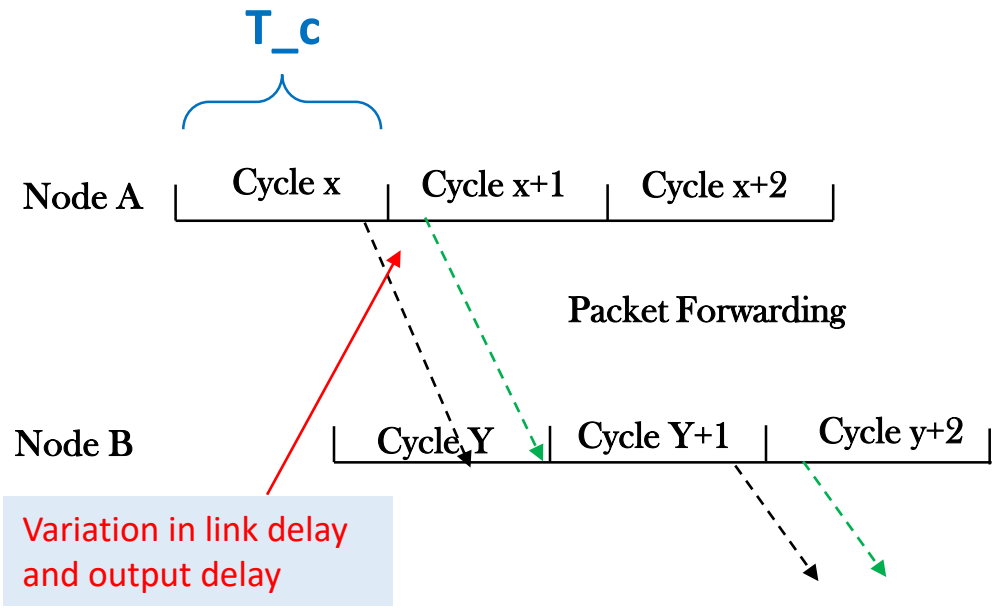


While T_c is bigger, the bounded latency is bigger ☹ and the jitter is bigger ☹.

- **The cycle ambiguity easily occurs, because of the variation in link delay and output delay.**

A Queuing Mechanism with Multiple Cyclic Buffers

- draft-ietf-detnet-bounded-latency describes requirements for CQF with more buffers.
- Norman Finn recommended to support long links and give good latency and bandwidth utilization in the paper named "Multiple Cyclic Queuing and Forwarding".



- **Decouple the link propagation delay and T_c to improve the bandwidth utilization**. Without sacrificing bandwidth utilization, T_c can be used with arbitrary link length and the number of buffer can be flexibly set.
- **To resolve the cycle ambiguity, a cycle label can be put in a packet**, which identifies which cycle the packet belongs with. Packets in different cycles carry different cycle labels.

Next Step

- Welcome to review it or contribute your idea to it!

Thank you!