

Contention management for Deterministic Networking

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n-green

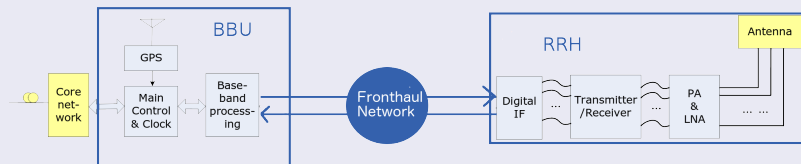
January 28, 2021



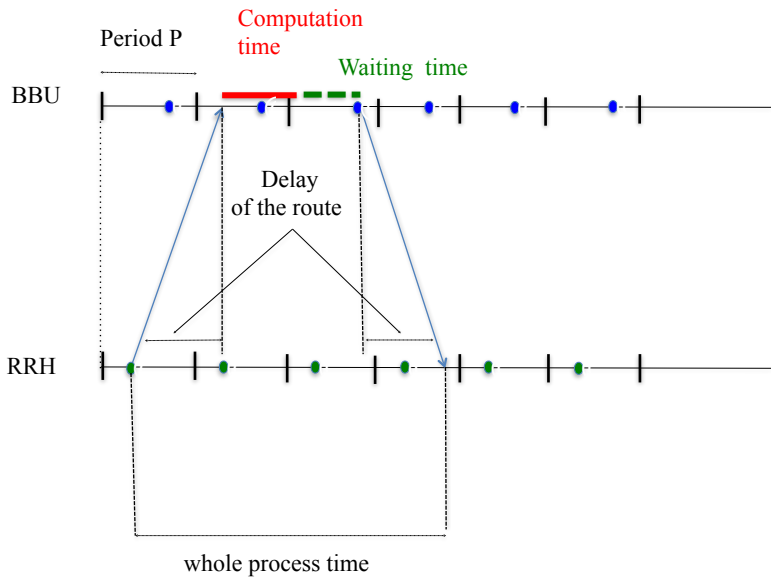
Problematic

- Latency critical application (C-RAN,).
- Stochastic networks could not ensure a low latency.
- NP-hard

Periodic Process



- Contention in the fronthaul network
- Need to guarantee the latency



Theoretical results

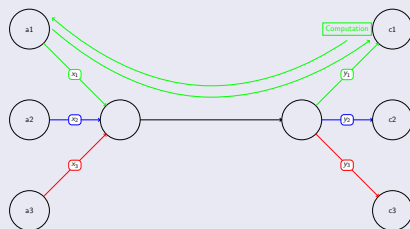
Problem

Find some time at which send the messages from the BBU/RRH, such that there is no collisions in the network.

NP-hard

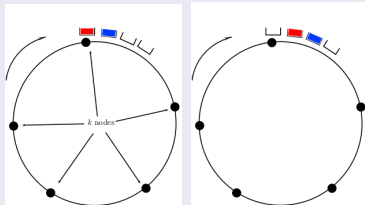
On general topology, even with restricted parameters.

Star network

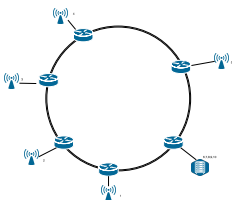


Optical ring

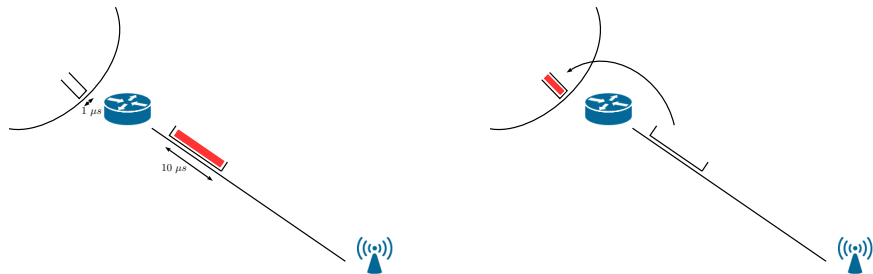
Model



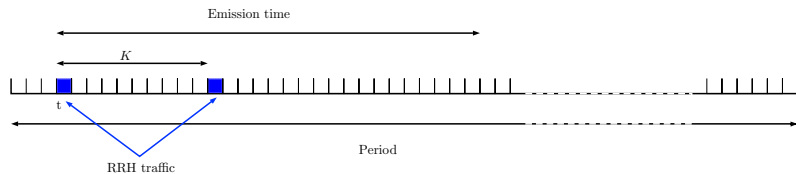
Waiting only at the insertion



Insertion



Insertion



Broadcast and select Policy

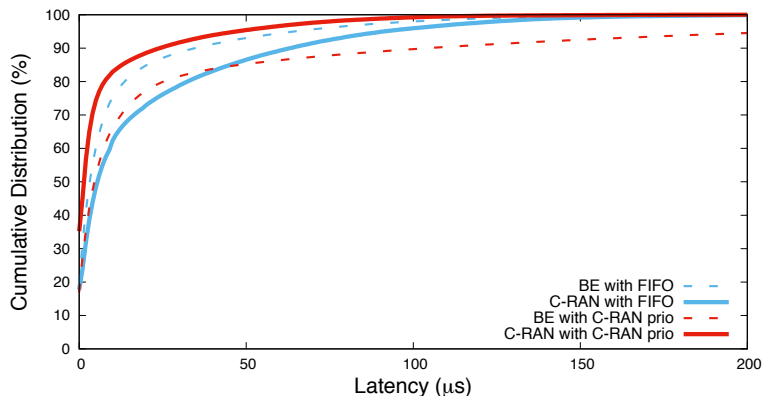
Parameters

Bit rate of an electronic interface R	10 Gbps
Optical ring bit rate $F \times R$	100 Gbps
Acceleration factor F	10
Container size C	100 kb
Unit of time $C/(F \times R)$	1 μ s
Length of the ring RS	100
Emission time ET	500
Period P	1,000
Number of RRH	5
Number of nodes n	5
Load induced by C-RAN traffic	50%
Load induced by BE traffic	40%

Optical ring problematic

- We got two kinds of traffic : CRAN - high priority, Best effort
- We want to observe the behavior of the ring and analyze the latency of CRAN
- We will try to find some methods to decrease the CRAN latency without increasing the Best effort latency too much

Opportunistic insertion policy



Cumulative distribution of the latency for different method in opportunistic insertion policy

Slot reservation

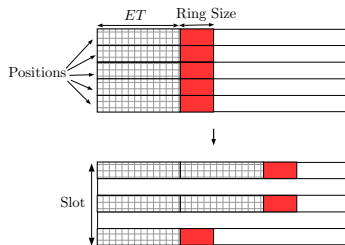


Figure: Repartition in the slot

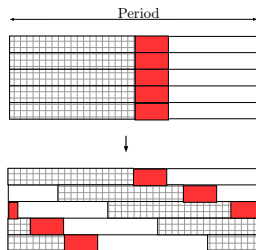
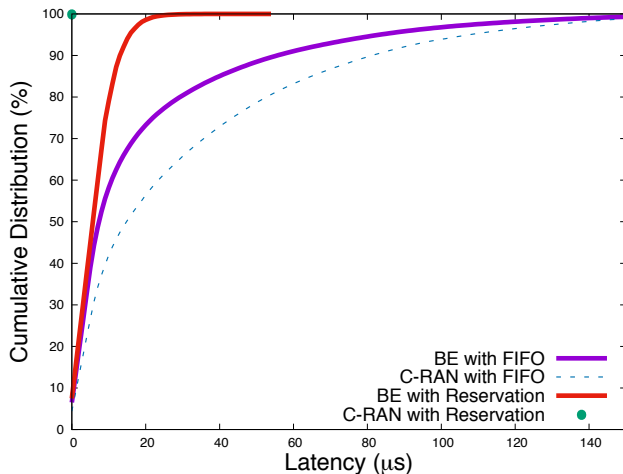


Figure: Repartition in the period

Slot reservation



Cumulative distribution of the latency with slot reservation