Latency Estimation in Bridge Device For .1CM project

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Latency Estimation in Bridge Device

- **Per section 7.3.1.3, current equation for MAX bridge latency estimation per hop is**

$$t_{MaxBridge} = t_{SF} + t_{SelfQueueing} + t_{Queueing} + t_{MaxIQFrameSize+Pre+SFD+IFG}$$

where t_{sf} is the store-and-forward delay of the bridge;

$t_{selfQueueing}$ is the delay caused by other frames in the same class;

$t_{Queueing}$ is the delay caused by other frames with higher priority, plus the delay of frame in transmission(maybe lower priority);

$t_{MAXIOFrameSize+Pre+SFD+IFG}$ is the transmission time for the chosen IQ data with Pre/SFD/IFG

- **Current latency example**

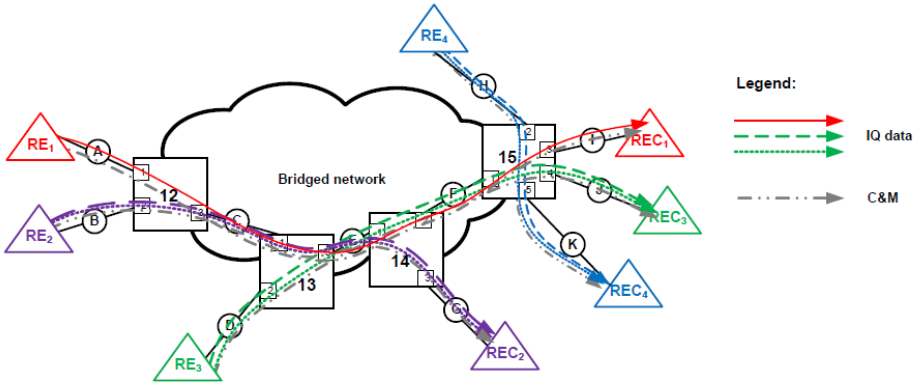

Figure C-3—Fronthaul example

*refer to 802.1CM Annex C

Bridge \ Flows	Fp	Fn	Min{F_p, F_n}
12	1	2	1
13	3	2	2
14	5	0	0
15	3	0	0

*F_p is the number of IQ flow on observation port
*F_n is the number of IQ flow on interfering ports
*RED flow, from RE_1 to REC_1 is in observation

Revision

- **According to equation in section 7.3.1.3, revised value should be ,**
  - Max Delay in Bridges, Profile A

Delay / Bridge	t_{sf}	$t_{selfQueueing}$	$t_{Queueing}$	$t_{MAXIOFrameSize+Pre+SFD+IFG}$	Total delay in hop (us)	Total path delay (us)
Bridge12	5	1.2336	1.2336	1.2336	8.7008	33.5696
Bridge13	5	2.4672	1.2336	1.2336	9.9344	
Bridge14	5	0	1.2336	1.2336	7.4672	
Bridge15	5	0	1.2336	1.2336	7.4672	

Table C-1—Bridge delays for Profile A

	Bridge 12	Bridge 13	Bridge 14	Bridge 15	Total
$t_{MaxBridge}$	9.9344 µs	9.9344 µs	7.4672 µs	7.4672 µs	34.8032 µs

  - Max Dealy in Bridges, Profile B

Delay / Bridge	t_{sf}	$t_{selfQueueing}$	$t_{Queueing}$	$t_{MAXIOFrameSize+Pre+SFD+IFG}$	Total delay in hop (us)	Total path delay (us)
Bridge12	5	1.2336	*0.01144	1.2336	7.47864	28.68096
Bridge13	5	2.4672	*0.01144	1.2336	8.71224	
Bridge14	5	0	*0.01144	1.2336	6.24504	
Bridge15	5	0	*0.01144	1.2336	6.24504	

Table C-2—Bridge delays for Profile B

	Bridge 12	Bridge 13	Bridge 14	Bridge 15	Total
$t_{MaxBridge}$	8.7008 µs	8.7008 µs	6.2336 µs	6.2336 µs	29.8688 µs

*$t_{queueing}$ *reduces to 114.4ns with pre-emption from Profile A, for worst case123-octets packet + Pre/SFD/IFG*

Summary

- **Suggest to modify C.2.1**
  - Change text on line 3 on page 31:
    - From "*In case of Bridge 12, $t_{SelfQueuing}^{12} = 2 \times t_{1542} = 2.4672\,\mu s$*" to "*In case of Bridge 12, $t_{SelfQueuing}^{12} = 1 \times t_{1542} = 1.2336\,\mu s$*"
  - Change Table C-1 to

	Bridge 12	Bridge 13	Bridge 14	Bridge 15	Total
$t_{MAXBridge}$	8.7008us	9.9344us	7.4672us	7.4672us	33.5696us

  - Change text on line 36 on page 31 :
    - From "*can be 65.1968us*" to "*can be 66.4304us*"
- **Suggest to modify C.2.2**
  - Change Table C-2 to

	Bridge 12	Bridge 13	Bridge 14	Bridge 15	Total
$t_{MAXBridge}$	7.47864us	8.71224us	6.24504us	6.24504us	28.68096us

  - Change text on line 8 on page 32:
    - From "*can be 70.1312us*" to "*can be 71.31904us*"

Suggestion

- **Network topology and traffic pattern will greatly impact E2E latency**
  - Better clarify characteristic of background flow, VBR vs. CBR
    - E.g. If 90% of bandwidth is used by IQ data, pre-emption in profile B will be unhelpful.
- **Further exploration and decompose for t_{SF} from Bridge architecture?**
  - Receiving buffer delay
  - Frame lookup and forwarding
  - Etc.

Thank You