Delay implications of different PCM packetization times for AoIP

3GPP TSG GERAN #39
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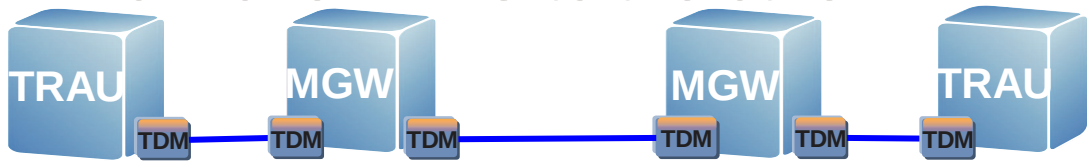
Assumptions

- Only the case of G.711 on the AoIP interface is considered (i.e. only the “Transcoder in BSS” scenario)
- Transcoders need to wait for “20 ms of speech” before transcoding (in both A <-> Abis directions)
- Only additional delays due to different packetizations and IP/TDM transport solutions are considered, and not those which do not depend on PCM packetization time on the AoIP interface
  - No *coding/decoding delays* are considered
  - No *processing/switching delays* are considered (since they basically depend on implementation only)
  - No *propagation delays* are considered (since they only depend on physics)
  - No *serialization delays* for IP transport are considered (since they basically depend on the link speed, and are typically negligible for high speed trunks)
  - No *buffering/de-jittering delays* are considered
- In 20ms -> 5ms re-packetization, shaping is assumed (packets are transmitted every 5 ms, and not in a burst)

Scenario 1: MS to MS call. Reference delay: to convey “20 ms of speech” from one TRAU to the other

- Reference case: “All-TDM”



Delay in the TDM case: **20ms** (time needed by the receiving TRAU to collect “20 ms of speech”) 20

- Case 1: AoIP, TDM transport between the MGWs

Delay with 5ms packets on AoIP: **20ms** = 0 (shaping) 0 5 15

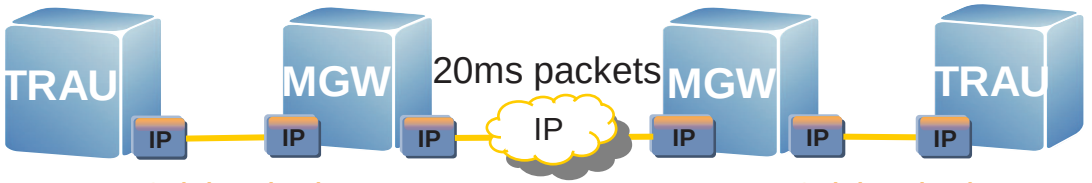
Delay with 20ms packets on AoIP: **20ms** = 0 0 20 0

- Case 2: AoIP, IP transport (5ms) between the MGWs

Delay with 5ms packets on AoIP: **15ms** = 0 (shaping) 0 0 15

Delay with 20ms packets on AoIP: **15ms** = 0 0 (shaping) 15 0

- Case 3: AoIP, IP transport (20ms) between the MGWs

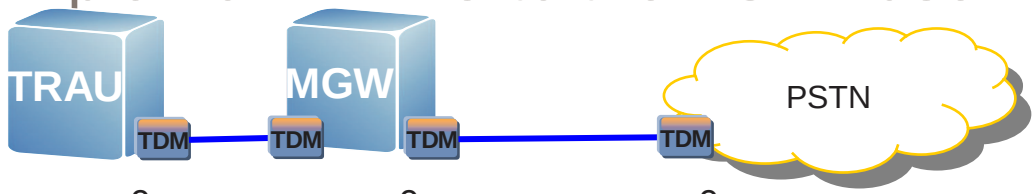


Delay with 5ms packets on AoIP: **30ms** = 0 (shaping) 15 0 (shaping) 15

Delay with 20ms packets on AoIP: **0ms** = 0 0 0 0

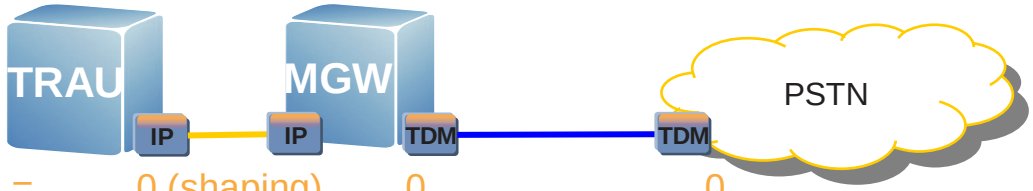
Scenario 2: MS -> PSTN call. Reference delay: to convey the first voice sample from TRAU to the PSTN user

- Reference case: “All-TDM”



Delay in the TDM case: **0 ms** 0 0 0

- Case 1: AoIP, TDM transport to the PSTN



Delay with 5ms packets on AoIP: **0ms** = 0 (shaping) 0 0

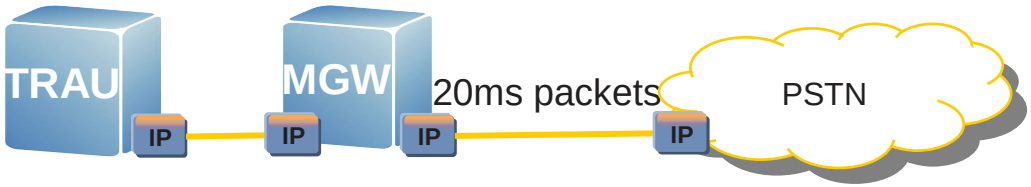
Delay with 20ms packets on AoIP: **0ms** = 0 0 0

- Case 2: AoIP, IP transport (5ms) to the PSTN

Delay with 5ms packets on AoIP: **0ms** = 0 (shaping) 0 0

Delay with 20ms packets on AoIP: **0ms** = 0 0 (shaping) 0

- Case 3: AoIP, IP transport (20ms) to the PSTN



Delay with 5ms packets on AoIP: **15ms** = 0 (shaping) 15 0

Delay with 20ms packets on AoIP: **0ms** = 0 0 0

Conclusions

- Since transcoders essentially work on samples of “20 ms of speech”, there is no disadvantage in using a 20ms PCM Packetization time on the AoIP interface (vs lower PCM packetization times)
- If shaping is applied in 20ms -> 5ms re-packetization, in some scenarios a 20ms PCM packetization time could be even better than a 5ms PCM Packetization time
- If shaping is not applied in 20ms -> 5ms re-packetization (i.e. 4 packets are sent in a burst), 5ms and 20ms PCM packetization times lead to equivalent results in terms of delay budget