Agenda Item:	**X**
Source:	**SAMSUNG Electronics Co.**
Title:	Performance evaluation on DSCH/DCH with gating.
Document for:	**Discussion**

Introduction

This contribution contains the performance evaluation result of DSCH/DCH with gating. At first time, the gating operation only aimed to be applied on DCH channel on which all radio bearers are suspended. In previous meeting, there was a comment that it seems better to apply gating on the DCH assisting DSCH. The impact of applying gating operation on DSCH/DCH channel configuration is evaluated by computer simulation. According to the simulation result under the operation condition consuming same amount of air resources, the case when the gating scheme is applied shows best performance from the perspective of the packet delay.

Simulation Conditions

C1. Source Traffic model
  The source traffic model concerned in this simulation is ETSI model except that the mean inter packet call arrival time is 10[sec]. [1]

C2. Radio Resource Scheduling
  The resource scheduling for DSCH is fulfilled every 100[ms].
   Applied scheduling algorithm is simple round robin scheme.

C3. Radio Link Condition
  All mobile station sharing a DSCH has same geometry. Therefore the transmission power of DSCH and DCH against each UE are identical.
  The transmission power reduction gain achieved from DPCCH gating is 3[db]. This result was obtained under the condition that gating rate is 1/3 and DPDCH activation ratio during gating is 10%. [2]

C4. Operation Times
  The DPCH setup time when transits from CELL_FACH to CELL_DCH is 1[sec].

C5. Channel Configuration
  One DSCH having 64[Kbps] transmission rate.
  Upto 4 legacy DCHs can simultaneously be established for assisting DSCH, whereas can upto 8 gating applied DCHs be established under the condition that same amount of radio resource is assigned to DCHs assisting DSCH operation.

Comparison Points

At the dormant duration between packet calls representing burst arrival of packets, the impact of DCH holding time is evaluated in this contribution. According to DCH holding time(let's call it as T_{hold}). it is possible to classify the operation schemes into three cases:
  Case 1 : Immediately release DCH if there is no traffic to be transmitted on DSCH. (T_{hold} = 1[sec])
  Case 2 : Maintain DCH until mean of inter packet call arrival time even though there is no traffic to transmitted on DSCH. (T_{hold} =15[sec])
  Case 3 : Apply gating operation while maintaining.(T_{hold_gating} = 15 [sec])
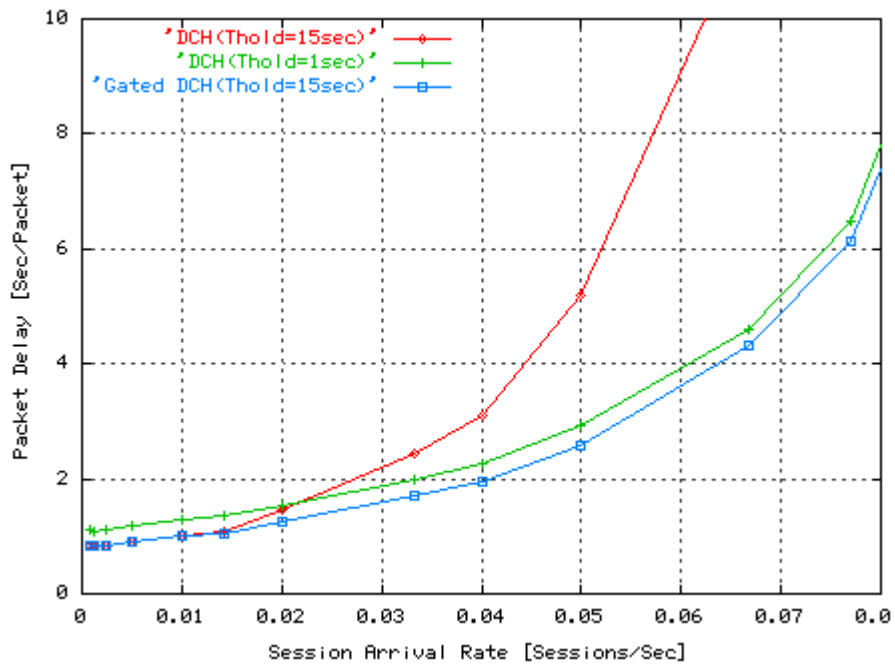
Simulation Results
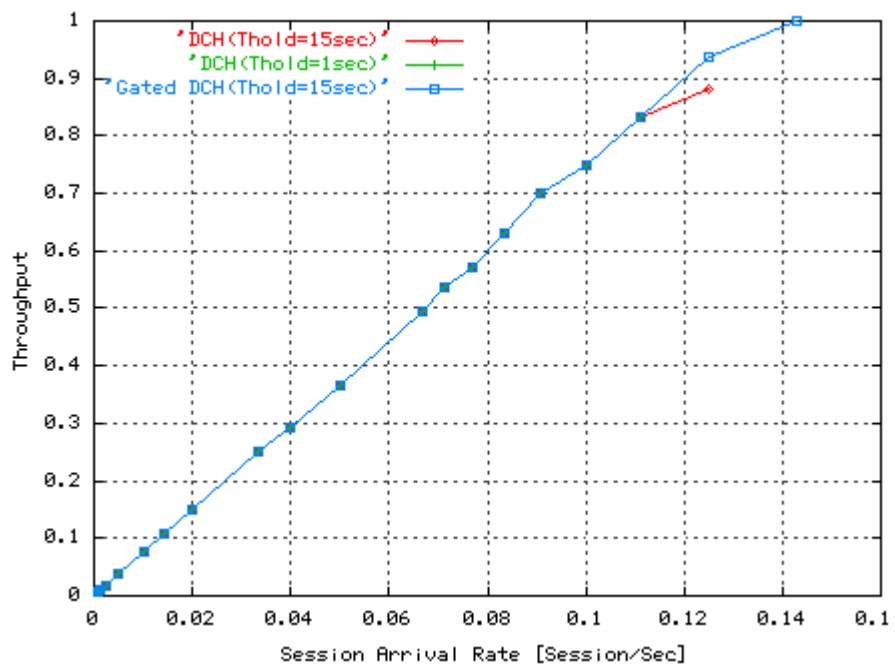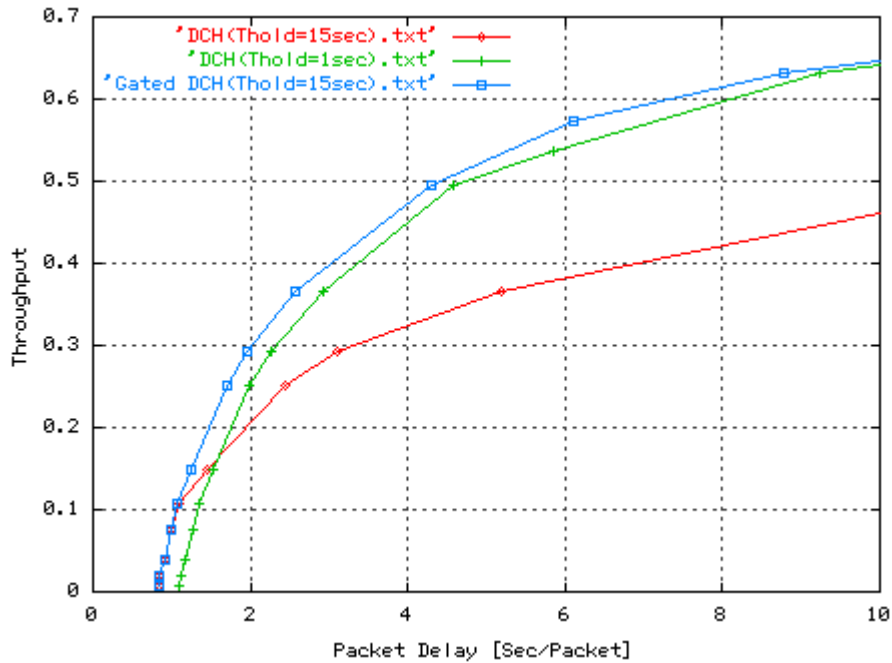

Figure 1. Packet Delay

Figure 2. Throughput

Figure 3. Delay vs. Throughput

Discussion

It have been proclaimed that the gated transmission of DPCCH has advantages at terminal power saving, uplink interference reduction and downlink power reduction. Through the above simulation result, it is also shown that the gated transmission of DPCCH increases the throughput of DSCH and reduces packet transmission delay. This result mainly comes from the fact that if the gating is applied the number of DCH simultaneously sharing DSCH is increased by reduction of DCH maintaining cost. It is very obvious that if shared by the more users without contention, the more utilisation of it is increased.

Reference

[1] TR 101 112 V3.2.0 (1998-04) Universal Mobile Telecommunications System(UMTS); Selection procedures for the choice of radio transmission technologies of the UMTS
[2] TSGR1#15(00)907 Uplink Interference Reduction Gain of Gated DPCCH Transmission, SAMSUNG

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