

Mueller Exhibit 39

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Date: Thu, 12 Aug 2004 11:24:30 +0900
Reply-To: Juho Lee <[\[log in to unmask\]](#)>
From: Juho Lee <[\[log in to unmask\]](#)>
Subject: A set of Samsung contributions on enhanced uplink
Content-type: multipart/mixed;

Dear all,

Attached please find a set of Samsung contributions on enhanced uplink.

R1-040851, Node B controlled scheduling (AI 9.2)
R1-040854, Uplink signalling for Node B controlled scheduling (AI 8.5)
(revised from R1-040696)
R1-040855, HARQ: physical layer aspects (AI 8.2) (revised from R1-040797)
R1-040864, HARQ principle (AI 9.1)

R1-040851 and R1-040864 are for joint session with RAN2.
In R1-040851, we discuss about the scheduling related issues identified in
the last meeting in Cannes and make a recommendation for each one.
In R1-040864, HARQ principle is discussed focusing on sync/async,
retransmission power setting, and SHO operation.

Best Regards,
Juho

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[R1-040864.zip](#) [application/x-zip-compressed]

[R1-040851.zip](#) [application/x-zip-compressed]

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Agenda item: 9.1
Source: Samsung
Title: HARQ principle
Document for: Discussion and Decision

1. Introduction

In RAN WG1 meeting #37 in Montreal, followings were agreed about HARQ:

- Incremental redundancy (IR) with chase combining (CC) as a sub-case.
- Stop and wait HARQ similar to HSDPA.
- Synchronous ACK/NACKs.
- HARQ/E-DCH in SHO.
 - Intra-Node-B “softer” HO supported for E-DCH.
 - Inter-Node-B soft HO: Should be supported, proposals invited.
- Re-ordering entity in the SRNC.

In this contribution, we continue to discuss further about the HARQ focusing on

- Synchronous vs asynchronous HARQ retransmissions.
- Power setting for retransmission.
- Operation in soft handover.

2. Synchronous vs asynchronous HARQ retransmission

There are two alternatives for HARQ mechanism being discussed.

- Synchronous HARQ. Transmission timing of each process is tied to the frame timing. The transmitter should send the retransmission to the receiver at the predefined retransmission timing.
- Asynchronous HARQ. Transmission timing of each process is not tied to the frame timing. Hence, the process ID should be transmitted to the receiver, which causes additional signalling overhead.

In HS-DSCH, since multiple UEs share the code resource of the serving Node B, there is a need for having flexible scheduling of transmission timing of each HARQ process. In uplink, however, since there is no such restriction on code resource due to other UEs, there is no need for employing the asynchronous HARQ retransmission.

In the last meeting in Cannes, it was discussed that in the asynchronous HARQ, certain urgent traffic could be sent through the process which has been finished with ACK signalling. In such cases, the gain of the asynchronous HARQ over the synchronous HARQ in latency would be $(N-1) \times TTI$ at most and $(N-1) \times TTI/2$ in average. However, that gain is not seen as significant compared to the additional L1 signalling overhead required to indicate the process ID every E-DCH TTI.

It is also noted that even with the synchronous HARQ retransmission, we could rely on a pre-emption functionality to avoid possible latency for such a really urgent traffic if needed.

Therefore, the synchronous HARQ is recommended.

3. Power setting for retransmission

In the last meeting in Cannes, it was agreed that logical channels mapped on the DCHs are always prioritised over those mapped on E-DCHs. According to the agreement, the UE operation is as follows, which is copied from [1]:

- The UE performs the TFC selection for the DCHs;
- Every E-DCH TTI, the UE shall estimate the remaining power;
 - Then it performs the TFC selection for the E-DCH, with the estimated remaining power, based on logical channel priorities like in the R99;

Even though the E-DCH transport format was properly selected for the initial transmission, the required power may not be available at the retransmission instant due to

- Change in DCH TFC
- Increased transmit power due to power control to overcome channel variation

There are two possible options to limit the total transmit power within the maximum power limit.

- Option 1: Equal scaling of the transmit power of all uplink channels to meet the power limitation.
- Option 2: Only E-DCH transmit power is scaled down to meet the power limitation.

With the option 1, the DCH transmission would suffer from unexpected performance degradation, since the DCH TFC is selected without taking into account the E-DCH retransmissions according to the prioritization of DCH over E-DCH.

Therefore, the option 2 is recommended to avoid the unexpected performance degradation of DCH having higher priority. It is noted that the option 2 is in line with the rule for selecting E-DCH TFC according to the prioritization as described above.

4. Soft handover operation

In soft handover, the UE would receive ACK/NACK signalling from all Node Bs involved in E-DCH reception. The UE should stop retransmission if it receives ACK from at least a single Node B. Otherwise, it may continue retransmissions.

When the UE is in soft handover, some of the active set Node Bs may not be able to receive all of previous transmissions, since receive power level may not be enough due to the uplink power control principle in soft handover. In this case, non-self-decodable retransmissions will not be helpful for those Node Bs that have missed the previous transmissions, especially, e.g., initial transmission. This would reduce the achievable selection combining gain and hence would degrade the system throughput. Hence, we recommend using only self-decodable redundancy versions when the UE is in soft handover.

5. Conclusions

Based on the discussion in this contribution, we propose to agree on the following recommendations as the HARQ principle.

Recommendations:

- Synchronous HARQ. Transmission timing of each process is tied to the frame timing. The UE should send the retransmission to the Node B at the predefined retransmission timing.

- Every E-DCH TTI, the UE shall estimate the power required for support of DCH as well as E-DCH retransmission. If the required power is not available, only E-DCH transmit power is scaled down to limit the total transmit power within the maximum power limit.
- HARQ operation in soft handover
 - The UE would receive ACK/NACK signalling from all Node Bs involved in E-DCH reception.
 - The UE should stop retransmission if it receives ACK from at least a single Node B. Otherwise, it may continue retransmissions.
 - It is defined that only self-decodable versions are transmitted in soft handover.

References

[1] R2-041460, TS 25.309 v0.2.0

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