3GPP TSG RAN WG1 ***TSGR1#4(99)391***
Meeting #4
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Yokohama, Japan

Source: **Philips**

Title: **Signaling for support of USCH and discontinuous DCH**

Agenda item: **5.3**

Document for:

Summary

This document discusses some of the issues relating to efficient packet transmission in the uplink, considers some of the proposed mechanisms, and makes some recommendations.

Discussion

Many details of uplink packet transmission are still open. However, we consider here three basic scenarios (not necessarily complete), where possible mechanisms are described in each case:

1) Rare packets.
In this case the RACH can be used (via FACH) to set up a dedicated channel on which packet transmission is carried out. When the transmission is completed the channel is dropped. Small packets could be carried in the RACH message part. Collisions on the RACH will cause delay.

2) Frequent packets.
Here the data flow (in either direction) is sufficient that a continuous dedicated channel is maintained in the uplink, with at least power control in the downlink. If there are significant gaps in the uplink data flow, then the dedicated channel(s) can be temporarily stopped and re-started when required again, as described in TSG RAN WG1 (99)191, Detail description of transmission stop and resumption control, NTT DoCoMo, Nynashamn, 22-26th March 99. However, downlink channelisation codes are assumed to be permanently allocated and resource is granted for at least a low rate DCH in the uplink. The starting and stopping of the DCH could be handled by Layer 1. Large packets may need to be scheduled, in which case the necessary higher layer signaling can be carried on the dedicated channels. A possible disadvantage of this scheme is that resources cannot be re-allocated until the connection is dropped.

3) Shared Uplink Resource.
This concept appears to be required where neither of the above are appropriate (i.e. the RACH is relatively inefficient due to lack of power control and collisions but a permanent DCH allocation would tie up too much uplink resource). If an uplink shared channel (USCH) is available, as described in TSG RAN WG1 (99)64, Operation of the Uplink Shared Channel, Motorola, Yokohama, 22-25th Feb 99., then the UE will need to ask for permission to transmit in the uplink. One mechanism which has been suggested is the use of a pre-amble in the form of an uplink DPCCH. In this case, successful reception by the infrastructure can be indicated by starting a downlink DPCCH. Once a DCH is set up, then this could be used to send the packet, or for a large packet to request additional uplink resource. One disadvantage of this scheme is that the base station

will need to constantly monitor the uplink to check for the appearance of the preamble (i.e.uplink DPCCH) for each UE using the USCH. This could have significant hardware implications if a large number of UE's are to be supported. Another possible disadvantage of the USCH scheme as described above, is that if there is no uplink resource available (i.e. the uplink is already full), then the UE could transmit pre-amble for some time without receiving any acknowledgement. Furthermore, it seems that the acknowledgement would not come from Layer 1, so the time delay could be considerable, causing significant interference in the uplink.

Possible Solution

In the case of the USCH, theses problems associated with the use of a pre-amble to request uplink resource can be solved by the use of the FAUSCH mechanism e.g. as described in TSG RAN WG1 (99)42, The FAUSCH concept, Philips, Yokohama, 22-25th Feb 99.. Here, the request for resource could be sent using FAUSCH, and the acknowledgement would either be sent on the FACH, or could be indicated by the starting of a downlink DPCCH. The benefits of this are that the FAUSCH is designed for fast detection by the base station using minimal hardware resources and generating minimal interference, whereas the DPCCH type of preamble proposed for USCH does not have there properties.

This approach is also consistent with use of FAUSCH for re-starting of a DCH (as suggested above for frequent packets). Here the acknowledgment could also be conveyed by re-starting the downlink DPCCH. One minor difference for FAUSCH here is that since the uplink and downlink resource is assumed to be already available, then this process could be handled entirely within Layer 1, giving a faster response than if L2/3 were involved.

It should be noted that only minor changes to FAUSCH are needed if proposals for modified RACH preambles are adopted e.g. TSG RAN WG1 (99)205, New RACH preambles with low auto-correlation sidelobes and reduced detector complexity, Ericsson, Nynashamn, 22-26th March 99.

Recommendations

1. We propose that FAUSCH is used as a signaling mechanism to support the operation of Uplink Shared Channels (USCH) (if adopted).

2. We propose that the FAUSCH approach is also considered as a physical layer mechanism for re-starting DCH's where the radio resource is already allocated.

3. We propose that FAUSCH is retained in the WG1 documentation (i.e. S1.11) for the time being, at least until final decisions are taken on contents of specifications to be included in Release 99. In this case the editors notes in 4.1.2, 5.2.2.1.4 and 5.2.2.1.5 are not needed since the relevant text is already in brackets.

This last point is fully consistent with working assumptions in RAN WG2 and decisions taken in RAN meeting no.2 (see TSG RAN (99)167, Proposal of working procedures related to items for Release 99, Drafting group, Fort Lauderdale, 2-4th Jan 99).

References

[1] TSG RAN WG1 (99)191, Detail description of transmission stop and resumption control, NTT DoCoMo, Nynashamn, 22-26th March 99
[2] TSG RAN WG1 (99)64, Operation of the Uplink Shared Channel, Motorola, Yokohama, 22-25th Feb 99.
[3] TSG RAN WG1 (99)205, New RACH preambles with low auto-correlation sidelobes and reduced detector complexity, Ericsson, Nynashamn, 22-26th March 99
[4] TSG RAN WG1 (99)42, The FAUSCH concept, Philips, Yokohama, 22-25th Feb 99.
[5] TSG RAN (99)167, Proposal of working procedures related to items for Release 99, Drafting group, Fort Lauderdale, 2-4th Jan 99