TSG-RAN Working Group2 (Radio layer 2 and Radio layer 3)
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Agenda Item:

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Title: Further Clarifications on Variable Rate Packet Transmission

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1 Introduction

Variable Rate Packet Transmission was proposed and in principal accepted at the last WG2 meeting (Tdoc R2-99298). In this scheme each high rate user is allocated a power threshold. When either shadow fading or inter-cell interference increase a user's power requirements above the set limit, the data rate is reduced. The lower data rate has lower power requirements and the user's power can remain under the set threshold. When channel conditions improve the user's data rate is increased allowing transmission of any data that may have been buffered.

This paper provides answers to some questions raised and more information on the simulations that will performed in order to select appropriate values for the different parameters.

2 Reply to questions and comments

- Does L1 indicate the transmission power value or the message (MPHY-STATUS) to L2 ?

  MPHY-STATUS. (Indication of transmission power value needs more bits)

- How often is the information sent ?

  The target is to keep the power of the user as close as possible to the selected threshold when data is available for transmission in order to minimise the buffering requirements and the over all delay in delivering the data to the user. To achieve this control will be as fast as conditions will allow. This requires determination of the different thresholds at which the rate can change, the averaging window over which the thresholds are determined and any associated hysterisis.

- Inband or outband information ?

  The simulation results will indicate how fast the changes in the data rate and hence signalling between L1 and MAC need to be. Given that the target is to stay as close to the threshold as possible, it is safer to associate this technique with inband signalling as the signalling may be quite fast, i.e. in the order of a very small number of radio frames.

- Determination of the allowable transmission power

  It depends on the traffic conditions, e.g., when the number of high rate packet users is small, it is desirable to be able to budget for a relatively high threshold for each user in order to provide better delay performance than the minimum required by each service. Simulations will be used to determine the exact values.

- Is this scheme applied to DCH during HO ?

  We propose that this rate control is not employed during SHO in order to avoid complicated control (e.g., differnt data rates and buffered data) between cell cites.

3 Application to DSCH

Variable Rate Packet Transmission taking radio channel fluctuation into account is applicable to DSCH. If the channel conditions of the user occupying DSCH becomes worse, DSCH can be released and then allocated to other user who has good channel conditions. This concept has been already included as a MAC function (Tdoc S2.21: 14.4.4 Priority handling between data flows of different users by means of scheduling)

4 Text proposal on R2.02: on "Radio Resource Management Strategies"

10. Power Management

10.1 Variable Rate Packet Transmission

10.1.1 Down-link power management

When the connection for packet services is established, the RRC considers the down-link traffic conditions, then assigns the TFCS to MAC and allowable transmission power to L1. The allowable transmission power is determined according to the service requirements and the traffic conditions, and is updated for each user when the traffic conditions change.

During a call, the physical layer averages the transmission power for that UE over one or several frames. If the averaged transmission power for the UE becomes higher than the allowable transmission power, that is, the channel conditions are bad, L1 indicates with the primitive MPHY-STATUS to the MAC that the "Allowable transmission power has been reached". The MAC in response reduces the data rate within TFCS, and the power control procedure then reduces the total transmission power for that UE and excess interference to other UEs is avoided.

When channel conditions improve and the averaged transmission power falls [x] dB below than the allowable transmission power the physical layer indicates with the primitive MPHY-STATUS to the MAC that the "Average transmission power is below allowable transmission power by xdB" (the values for [x] are chosen to match the power requirements of different increments for the transport channels within the TFCS). The MAC in response increases the data rate by increasing the number of transport blocks delivered to L1 and the physical layer increases the total transmission power to the UE by the predefined amount. This allows data that was buffered during bad channel conditions to be delivered to the UE.

10.1.2 Up-link power management

When the connection for packet services is established, the RRC assigns the TFCS to MAC and the allowable transmission power to L1. The allowable transmission power corresponds to the UE capability class. During a call, the physical layer averages the transmission power over one or several frames. If the averaged transmission power becomes higher than the allowable transmission power, L1 indicates with the primitive MPHY-STATUS to the MAC that the "Allowable transmission power has been reached". The MAC in response reduces the data rate within TFCS, and the power control procedure then reduces the total transmission power.

When channel conditions improve and the averaged transmission power falls [x] dB below than the allowable transmission power the physical layer indicates with the primitive MPHY-STATUS to the MAC that the "Average transmission power is below allowable transmission power by xdB" (the values for [x] are chosen to match the power requirements of different increments in the number of transport channels within the TFCS). The MAC in response increases the data rate by increasing the number of transport blocks delivered to L1 and the physical layer increases the total transmission power by the predefined amount. This allows data that was buffered during bad channel conditions to be transmitted to Node B.