

Source: Nokia

DSCH power control

Introduction

The DSCH has been included in 3GPP specifications for the resource effective downlink packet transmission channel. The DSCH as covered in [1-4] for the physical layer or generally explained in [5] has one area where the specifications do not cover all the details, namely power control.

Basically the power control for DSCH is rather clear when there is only on DCH involved, but the UTRAN operation in soft handover has been pointed out needed some further work.

This contribution looks at few alternatives to improve the DSCH power control operation in soft handover and proposed

The problem

Basically the problem comes from the fact that DCH may be in soft handover and the DSCH is not. As the Node B first of all does not have information about the soft handover state (longer-term situation) or about the relative power levels for each of the radio links transmitted for a single UE (short-term situation).

Alternatives.

Several ways exists in principle to provide relevant information for the Node B to ensure DSCH power control in all cases.

In the long term the information about soft handover status could be considered via lub but it does not provide real time information for the power control needs in this particular situation.

For the short-term case, the idea mentioned earlier was to provide separate power control command stream for DSCH in the uplink direction. This however has some problems as DSCH does not contain pilot or other reference data and if active only periodically. Also this option would need modifications for the DCH power control operation.

As for the Node B the relevant information is actually whether the Node B is "dominating" or not then such information should be provided by the Node B. Again for the long term situation the measurements have been specified but for the short term situation the information is not normally available to the Node B.

If determining the minimum changes between the releases, the existing method for SSdT signalling could be used for this purpose as well. Then Node B may determine whether the DSCH should follow DCH power level or not or should it be transmitted in certain fixed power level.

Proposed solution

The following is proposed for improved DSCH power control in soft handover:

UTRAN can activate the SSdT signalling even the SSdT transmission is not necessary used in the downlink direction. The Node B is given power offset value that is used whether the DSCH is sent from the Node B determined to be the primary one or whether the Node B sending the DSCH is the secondary one. The primary/secondary status would be determined with sliding average for example over 10 frames with parameter given how many primary indications are needed to use the primary value power offset for DSCH.

Specification changes:

The specification changes are rather small:

- In the physical layer specifications, the SSdT signalling is allowed to be used even if the SSdT is not activated in the downlink
- The same option needs to be reflected in the SSdT information elements in RRC specification
- The DSCH power control section should be elaborated to indicate this possibility and for the Iub specification the power offset parameter as well as the averaging window parameter would need to be added.

Impacts to the Release –99 hardware

From the UE point of view the hardware is not impacted, the same slot structures are kept; the DCH power control algorithm is unchanged. The only issue is the case of doing the normal soft handover combining even sending in the uplink the SSdT commands. As SSdT is mandatory for release –99 already, there are no new hardware issues involved

Clearly there is no backwards compatibility issues between Releases, the UTRAN can mix Release –99 terminals with Releases –00 (or higher) terminals that use the SSdT signalling to improve the DSCH power control as the method only in the downlink impacts the principle of setting the power offset for DSCH frame for particular UE and what is the form of the downlink transmission in case of DCH (is SSdT applied or not, which is not causing any issues between UEs. This may happen in Release –99 as well SSdT being UE specific parameter)

Suggested action

If the resulting changes are considered feasible and useful, it is suggested that a TR is produced for the next meeting including the changes needed for the physical layer specifications and other working groups. Then the decision whether TSG RAN WG1 supports the addition of such a feature can be done in WG1#15 which allows to provide the TR for TSG RAN#9 for co-ordination with other WGs (as TSG RAN approval is needed for a study item to proceed to a CR phase) If WG1 conclusions are positive (in WG1#15) the other working groups are informed and enquired do they want to cover their part in a TR of their own or not. Final CRs would then need to be available for TSG RAN#10 (for all TSG RAN WGs impacted).

References:

- [1] TS 25.211
- [2] TS 25-222
- [3] TS 25.223
- [4] TS 25.224
- [5] Holma,H. and Toskala,A., "WCDMA for UMTS", John Wiley & Sons, 2000