

Agenda item: AH 14
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Title: Status Information for Channel Assignment in CPCH
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1. Introduction

Common Packet Channel (CPCH) has been proposed and adopted for the efficient packet communication over uplink common channels [1, 2]. To enhance the performance of CPCH, a channel assignment scheme is proposed [3]. For more efficient channel assignment, it is beneficial if UE can have the availability of each data rate or the available maximum data rate before the access attempt of CPCH [4]. And there was a paper proposing UE's channel selection with status information only [5]. In this paper, we summarise the status broadcasting schemes for UTRAN's channel assignment and UE's channel selection respectively to clarify the discussion on status broadcasting. And we also propose the schemes for sending availability information of each data rate or available maximum data rate is proposed for more efficient channel assignment in CPCH.

2. Summary of Status broadcasting for UTRAN's CA and UE's channel selection

The following table summarises the difference of Status information for UTRAN's CA and UE's channel selection.

	Status Information	Channel Selection	Purpose of Status broadcasting
UTRAN's CA	Availability of each data rate or Available Maximum data rate	UTRAN	Overload control (reduce needless attempt)
UE's Channel selection	Availability of each channel (More information is required.)	UE	Channel selection + Overload control

3. Proposed Scheme

In this paper, we propose two schemes for sending channel status information via downlink to enhance the CPCH with channel assignment. The main features of the schemes are as follows.

(1) UTRAN broadcasts the availability of each data rate.

- The availability information is sent by OOK. (On-off Keying)

In most cases, a CPCH is available in a system. And the probability that no CPCH is available for a data rate is low. This makes the distribution of availability of a data rate asymmetric. OOK is energy-efficient for an information with asymmetric distribution. (that is, when the probability of unavailability of a data rate is less than 25%.)

- The availability information will be sent using the NAK of AP-AICH.

UTRAN sends the NAK when no CPCH is available for a group (or rate) of CPCH's. This information will be sent periodically. But, nothing will be sent when there is an available CPCH for the CPCH group. So, the availability information will be sent by OOK. System can select a signature belonging to the CPCH group and use this signature to send the availability of the CPCH group.

There may be cases that a NAK should be sent for a CPCH attempt when UTRAN needs to send availability information. But, this is sent only when no CPCH is available. So there is no conflict with the availability information.

UE can receive the availability information of the CPCH group (data rate) by detecting the AP-AICH signature selected to represent the CPCH group.

(2) UTRAN sends the available maximum data rate.

- UTRAN broadcasts the lowest data rate unavailable using the NAK of AP-AICH

If UTRAN supports multiple data rates (more than 2 rates), it needs much downlink capacity to broadcast even the availability of each data rate. In that case, UTRAN can send the lowest data rate unavailable using the NAK of AP-AICH. UTRAN can select a signature to represent a CPCH data rate and send NAK of that signature if the corresponding data rate is the lowest unavailable. It is very beneficial since only one AP-AICH is necessary per broadcast period for status information. This scheme can be efficiently used with assignment method 2 in Tdoc99-h14.

UE can get the lowest data rate unavailable by deciding the lowest data rate with NAK of AP-AICH.

4. Conclusion

In this paper, we propose a scheme in which UTRAN send channel status information via downlink for more efficient channel assignment. UTRAN send the availability of each data rate using the NAK of AP-AICH. This advantage of this scheme is

- The availability information will be sent using existing AP-AICH. So, there's no need of a new channel for status information.
- Since the availability is sent by NAK of AP-AICH (OOK), this scheme minimise the consumption of downlink capacity.
- If UTRAN supports multiple data rate and broadcasts the lowest data rate unavailable, it is possible to reduce information required for the status information. Only one NAK-AICH will be broadcast at a period.

References

- [1] GBT/ Tdoc 592: CPCH physical layer procedures.
- [2] GBT/Tdoc 594: Overview of System-wide CPCH Access procedures.
- [3] Samsung and Philips/TdocB49: Enhanced CPCH with Channel Assignment.
- [4] Philips/Tdocabc: Enhanced CPCH with status monitoring and code assignment.
- [5] GBT/Tdoc j34: CPCH status broadcast proposal and CR020 25.214.