Agenda item: **AH 14**

Source: **SAMSUNG Electronics Co.**

Title: **More Advantages of Channel Assignment for CPCH**

Document for: **Discussion**

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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]. Channel Assignment (CA) is proposed for more efficient and flexible resouce usage of CPCH [3]. Some of the advantages of Channel Assignment were presented in the last WG1 meeting [4] and these advantages were agreed at the last WG2 meeting stated in the liasion response from WG2 [5]. In this paper, we summarise the advantage of channel assignment of CPCH proposed in [4] and present more advatanges of CA.

2. Advantages of Channel Assignment presented in Tdoc R1-h14.

In this section, we summarize the advatages of CA that were presented in [4]. These advantages are agreed at the last WG2 meeting as stated in the liasion response from WG2 [5].

(1) The collision probability is independent of the number of occupied CPCH's

If there is a pre-determined mapping between an access preamble and a CPCH, then the number of available preambles decreases with monitoring as more CPCH's are used. This can increase the collision probability for high load case (that is, when many CPCH's are used).

With channel assignment, all the preambles can be used irrespective of the number of occupied CPCH's. So, the collision probability is independent of the number of occupied CPCH's.

(2) Flexible code resource allocation is possible.

UTRAN can select the allocation method of CPCH's to multiple data rates. Some possible methods are as follows.

(Method 1)

UTRAN can the set the number of CPCH's for each data rate. In this case, UTRAN assigns a CPCH to a UE when there is a vacant channel for the data rate. Therefore, UTRAN cannot assign a CPCH when the CPCH's for the data rate are used up, even though UTRAN has more resources.

As an example, consider the case of 8 CPCH's and 3 different data rates of 64kbps, 128 kbps, 256kbps. Among the 8 CPCH's, 4, 2 and 2 CPCH's are allocated for each data rate respectively.

(Method 2)

UTRAN set the maximum number of CPCH's and the total data rate (or capacity) allowed for the CPCH's. Each CPCH can be assigned for any data rate. For each CPCH request, UTRAN checks whether the requested data rate can be served and assigns a CPCH to the UE if the total data rate of CPCH's does not exceed the capacity allowed for the CPCH's.The advantage of this method is that the availability of CPCH is not limited by the number of CPCH's assigned to a specific data rate but it is limit by the capacity allowed for the CPCH's.

(3) Best Performance can be obtained.

UTRAN can allocate and control the available resource for the CPCH. This scheme maximises resource usage efficiency. Simulation results shows that CPCH performance is optimum with channel assignment [6], [7], [8].

(4) Minimum UE complexity is required.

UE complexity required for channel assignment is minimal. The only UE complexity increase is the decoding of Channel Assignment AICH (CA-AICH) which is sent in the same channelization code as CD-AICH. The decoding of CA-AICH is needed only one time and the signature for the CA-AICH is designed to reduce the complexity of UE.

(5) There are cases that monitoring is impossible at UE. Channel Assignment can solve the problem of discontinuity in monitoring.

There are cases when UE cannot monitor the downlink. Examples of these cases are just after handoff and compressed more operation. Channel assignment can solve the problem of discontinuity in monitoring.

(6) Less sensitive to the errors due to deep fading.

If the channel status information is sent with channel coding and interleaving, the delay can degrade the monitoring performance. So, all proposals on channel status information are based on data symbols without interleaving. Symbols without interleaving are very sensitive to the fading in the downlink.

However, UE decodes the CA-AICH only when it receives the CD-AICH with reliable strength. The error rate of the CA-AICH is very low, since channel quality can be guaranteed by reliable CD-AICH.

3. More Advantages of Channel Assignment for CPCH

In this section, we present more advantages of channel Assignment that are not described in Tdoc R1-h14.

(1) Channel Assignment is less sensitive to the delay.

The performance of UE's channel selection with only status monitoring degrades drastically as the period of broadcasting increases. But, UTRAN can have the most recent status of CPCH's, channel selection at UTRAN his has clear advantage in throughput, delay and needless attemps These performance gains can be observed in the simulation results from Samsung [8].

(2) Less downlink capacity is required with CA.

It is required to broadcast the availability of each CPCH for UE' channel selection with monitoring only. This means that UTRAN should broadcast the availability with high frequency, which cost a lot of downlink capacity. But, UTRAN needs to broadcast the availability of each data rate or available highest data rate. This can minimized the downlink capacity loss due to the status information.

(3) CA can support sharing access preambles for RACH and CPCH

Sharing access preambles for RACH and CPCH is approved. With this scheme, the number of signatures available for CPCH can be 4-12. For example, 4 signature can be allocated for CPCH, and 12 signatures can be allocated for RACH. In this case, the system cannot support up to 16 CPCH's without channel assignment scheme, since at least one AP signature is required for a CPCH without CA. This can be a limiting factor for the CPCH operation. But, there's no limitation on the number of CPCH's with CA.

4. Conclusion

In this paper, we present the advantages of channel assignment for CPCH. Because of these advantages, channel assignment should be included in the CPCH procedure.

References

[1] GBT/ Tdoc R1-592: CPCH physical layer procedures.

[2] GBT/Tdoc R1-594: Overview of System-wide CPCH Access procedures.

[3] Samsung and Philips/Tdoc R1-f49: Enhanced CPCH with Channel Assignment.

[4] Samsung/ Tdoc R1-h14: Advantages of Channel Assignment for CPCH.

[5] WG2/ Tdoc R2-f83: Response for LS on Channel Assignment for CPCH.

[6] Philips/Tdoc R1-abc : Performance of CPCH.

[7] Samsung/Tdoc R1-h15 : Performance Evaluation of CPCH.

[8] Samsung/Todc R1-j73 : Performance Evaluation of CPCH (Ver. 2)