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**Datasheet for the decision  
of 30 March 2016**

**Case Number:** T 1439/13 - 3.5.05

**Application Number:** 09010508.1

**Publication Number:** 2154808

**IPC:** H04L1/18

**Language of the proceedings:** EN

**Title of invention:**

Method and apparatus of handling TTI bundling retransmission

**Applicant:**

Innovative Sonic Limited

**Headword:**

Non-adaptive retransmissions/SONIC

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

Inventive step - all claim requests (no)

**Decisions cited:**



**Beschwerdekammern**  
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Case Number: T 1439/13 - 3.5.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.05**  
**of 30 March 2016**

**Appellant:** Innovative Sonic Limited  
(Applicant) 2nd Floor, The Axis  
26 Cybercity  
Ebene 72201 (MU)

**Representative:** Hoefler & Partner Patentanwälte mbB  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 8 February 2013  
refusing European patent application  
No. 09010508.1 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chair** A. Ritzka  
**Members:** K. Bengi-Akyuerek  
D. Prietzel-Funk

## **Summary of Facts and Submissions**

I. The appeal is against the decision of the examining division to refuse the present European patent application on the grounds of lack of clarity (Article 84 EPC) and lack of novelty (Article 54 EPC) with respect to the claims of a main request and three auxiliary requests (all filed on 19 December 2012), having regard to the disclosure of

D1: "Bundling Issues", 3GPP TSG-RAN WG2 Meeting #62bis, document R2-083107, pp. 1-5, July 2008.

II. With the statement setting out the grounds of appeal, the appellant re-filed the claims of the main request and the auxiliary requests underlying the appealed decision as its main request and first to third auxiliary requests. It requested that the decision of the examining division be set aside and that a patent be granted on the basis of the main request or one of the auxiliary requests. In addition, the appellant requested that the appeal fee be reimbursed due to a violation of its right to be heard by the examining division.

III. In an annex to the summons to oral proceedings pursuant to Article 15(1) RPBA, the board expressed its preliminary opinion on the appeal. In particular, it raised objections under Articles 84, 123(2) and 56 EPC, mainly having regard to D1. Furthermore, the appellant was also informed that the requested reimbursement does not seem to be equitable by reason of a substantial procedural violation under Rule 103(1) (a) EPC.

- IV. By letter of reply dated 25 February 2016, the appellant submitted amended claims according to three further auxiliary requests (i.e. "New Auxiliary Requests 1 to 3").
- V. Oral proceedings were held on 30 March 2016, during which the appellant withdrew its request for reimbursement of the appeal fee. All the present claim requests were admitted into the appeal proceedings and their allowability was discussed.

The appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request, submitted with the letter dated 19 December 2012, or of new auxiliary requests 1 to 3 submitted with the letter dated 25 February 2016, or of auxiliary requests 1 to 3 submitted with the letter dated 19 December 2012.

At the end of the oral proceedings, the decision of the board was announced.

- VI. Claim 1 of the **main request** reads as follows:

"A method for handling retransmission of a Transmission Time Interval (TTI) bundle in a user equipment (UE) of a wireless communication system, the UE operating in a TTI bundling mode, a first transmission of the TTI bundle being generated according to an uplink grant received on a Physical Downlink Control Channel (PDCCH), follow-up transmissions of the TTI bundle being generated in a non-adaptive retransmission way, the method comprising:  
performing a bundle retransmission of the TTI bundle, the bundle retransmission being triggered by a Hybrid Automatic Retransmission Request (HARQ) process

responsible for the TTI bundle (402); characterized by determining whether to generate a non-adaptive retransmission for a current transmission opportunity according to a last received feedback of this HARQ process no matter whether the current transmission opportunity is a first transmission opportunity of the bundle retransmission when no uplink grant for the current transmission opportunity has been received on the PDCCH (404)."

Claim 1 of **new auxiliary request 1** reads as follows (amendments to claim 1 of the main request underlined by the board):

"A method for handling retransmission of a Transmission Time Interval (TTI) bundle in a user equipment (UE) of a wireless communication system, the UE operating in a TTI bundling mode, a first transmission of the TTI bundle being generated according to an uplink grant received on a Physical Downlink Control Channel (PDCCH), follow-up transmissions of the TTI bundle being generated in a non-adaptive retransmission way, the method comprising:

performing a bundle retransmission of the TTI bundle, the bundle retransmission being triggered by a Hybrid Automatic Retransmission Request (HARQ) process responsible for the TTI bundle (402); characterized by determining whether to generate a non-adaptive retransmission for a current transmission opportunity of the bundle retransmission according to a last received feedback of this HARQ process no matter whether the current transmission opportunity of the bundle retransmission is a first transmission opportunity of the bundle retransmission when no uplink grant for the current transmission opportunity of the bundle retransmission has been received on the

PDCCH (404)."

Claim 1 of **new auxiliary request 2** reads as follows (amendments to claim 1 of the main request underlined by the board):

"A method for handling retransmission of a Transmission Time Interval (TTI) bundle in a user equipment (UE) of a wireless communication system, the UE operating in a TTI bundling mode, a first transmission of the TTI bundle being generated according to an uplink grant received on a Physical Downlink Control Channel (PDCCH), follow-up transmissions of the TTI bundle being generated in a non-adaptive retransmission way, the method comprising:

performing a bundle retransmission of the TTI bundle, the bundle retransmission being triggered by a Hybrid Automatic Retransmission Request (HARQ) process responsible for the TTI bundle (402); characterized by for all transmission opportunities of the bundle retransmission, determining whether to generate a non-adaptive retransmission for a current transmission opportunity according to a last received feedback of this HARQ process no matter whether the current transmission opportunity is a first transmission opportunity of the bundle retransmission when no uplink grant for the current transmission opportunity has been received on the PDCCH (404)."

Claim 1 of **new auxiliary request 3** reads as follows (amendments to claim 1 of the main request underlined by the board):

"A method for handling retransmission of a Transmission Time Interval (TTI) bundle in a user equipment (UE) of a wireless communication system, the UE operating in a

TTI bundling mode, a first transmission of the TTI bundle being generated according to an uplink grant received on a Physical Downlink Control Channel (PDCCH), follow-up transmissions of the TTI bundle being generated in a non-adaptive retransmission way, the method comprising:

performing a bundle retransmission of the TTI bundle, the bundle retransmission being triggered by a Hybrid Automatic Retransmission Request (HARQ) process responsible for the TTI bundle (402); characterized by for all transmission opportunities of the bundle retransmission, determining whether to generate a non-adaptive retransmission for a current transmission opportunity of the bundle retransmission according to a last received feedback of this HARQ process no matter whether the current transmission opportunity of the bundle retransmission is a first transmission opportunity of the bundle retransmission when no uplink grant for the current transmission opportunity of the bundle retransmission has been received on the PDCCH (404)."

Claim 1 of **auxiliary request 1** comprises all the features of claim 1 of the main request, with the additional phrase

", wherein

the non-adaptive retransmission for the current transmission opportunity is generated if the last received feedback of this HARQ process is a non-acknowledgement signal, and

the non-adaptive retransmission for the current transmission opportunity is not generated if the last received feedback of this HARQ process is an acknowledgement signal."

Claim 1 of **auxiliary request 2** and **auxiliary request 3** comprises all the features of claim 1 of the main request and auxiliary request 1 respectively, except that it no longer includes the following phrase:

"when no uplink grant for the current transmission opportunity has been received on the PDCCH (404)."

### **Reasons for the Decision**

1. Since claim 1 of "auxiliary request 1" has the largest number of limiting features (i.e. is the most limited in scope) compared to the other claim requests on file, the board finds it expedient to discuss that request first.

2. AUXILIARY REQUEST 1

Claim 1 of this auxiliary request is identical to claim 1 of the first auxiliary request underlying the appealed decision, and comprises the following features (as labelled by the board):

A method for handling re-transmission of a TTI (Transmission Time Interval) bundle in a UE (User Equipment) of a wireless communication system,

A) the UE operating in a TTI bundling mode;

B) a first transmission of the TTI bundle being generated according to an uplink grant received on a PDCCH (Physical Downlink Control Channel), follow-up transmissions of the TTI bundle being generated in a non-adaptive re-transmission way,

the method comprising the following steps:

C) performing a bundle re-transmission of the TTI bundle, the bundle re-transmission being triggered



- by an HARQ (Hybrid Automatic Retransmission Request) process responsible for the TTI bundle;
- D) determining whether to generate a non-adaptive re-transmission for a current transmission opportunity according to a last received feedback of this HARQ process, no matter whether the current transmission opportunity is a first transmission opportunity of the bundle re-transmission, when no uplink grant for the current transmission opportunity has been received on the PDCCH;
  - E) if the last received feedback of this HARQ process is a NACK signal, non-adaptive re-transmission for the current transmission opportunity is generated;
  - F) if the last received feedback of this HARQ process is an ACK signal, non-adaptive re-transmission for the current transmission opportunity is not generated.

## 2.1 Article 84 EPC: clarity

The examining division found that the subject-matter of claim 1 was not clearly defined, contrary to the requirements of Article 84 EPC (cf. appealed decision, Reasons A.1). Even though the board has doubts whether certain terms used in present claim 1 indeed have a well-recognised meaning (particularly owing to the fact that the language and terminology of documents relating to telecommunication standards are generally not consistently applied), it was not necessary to decide on the issue of clarity as regards claim 1 since its subject-matter, based on the interpretations provided by the present description and by the appellant, was considered sufficiently clear to eventually establish its lack of inventive step with regard to the prior art at hand (see point 2.2 below).

2.2 Article 52(1) EPC: novelty and inventive step

2.2.1 Referring to the observations made above, the board adopts the following interpretations for the assessment of novelty and inventive step with regard to claim 1 of this claim request:

Concerning features D) to F), the board interprets the term "transmission opportunity" to mean "one particular TTI of a TTI bundle", i.e. one particular time slot (sub-frame) among all available time slots of the corresponding TTI bundle, whose TTIs each are supposed to carry the same data packet (transport blocks), according to the 3GPP-standard terminology (see also page 1, lines 19-23 of the present application as filed). Furthermore, "non-adaptive re-transmission" is understood to refer to a re-transmission of a TTI on the same resource (i.e. physical or logical channel) as was used for the last TTI transmission, as opposed to an "adaptive re-transmission" which typically refers to re-transmissions on the resource indicated via the Physical Downlink Control Channel (PDCCH).

As regards the determining step of feature D), the board adopts the appellant's interpretation that the corresponding determination step is required to be performed for *each* TTI of the TTI bundle, i.e. whether or not the current TTI is the first TTI of the re-transmitted TTI bundle, and that the phrase "last received feedback of this HARQ process" is understood to refer either to a "non-acknowledgement (NACK) signal" or an "acknowledgement (ACK) signal" (not least due to the presence of features E) and F) of claim 1).

2.2.2 Based on the above interpretations, the board regards document D1, relating to a proposal for TTI bundle

re-transmissions in 3GPP-based wireless communication systems, as a suitable starting point for the assessment of novelty and inventive step.

As to features A) and B), D1 prescribes that, in the event that TTI bundling is configured (with TTI bundles labelled "0" to "3"; see Fig. 5.3 on page 4), a corresponding data packet is transmitted within the initial TTI ("TTI#0") of the first TTI bundle ("bundle 0") upon receiving an uplink grant via the PDCCH (see page 4, paragraph beneath Fig. 5.3, third line: *"TTI#0 a new transmission takes place (PDCCH received ...)"*). The same data packet is further transmitted (i.e. re-transmitted) in the following second to fourth TTIs ("TTI#1-3") of the first TTI bundle (see page 4, paragraph beneath Fig. 5.3, fourth and fifth lines: *"TTI#1-3 the HARQ entity ... automatically generates non-adaptive retransmissions"*).

As to feature C), D1 teaches that, upon receipt of a negative acknowledgement ("NACK") associated with the last TTI ("TTI#3") of the first TTI bundle ("bundle 0") and after the lapse of a round-trip time ("RTT"), the TTIs (starting from "TTI#16") associated with the first TTI bundle are re-transmitted by the HARQ process responsible for that TTI bundle (see page 4, Fig. 5.3 in conjunction with the paragraph beneath Fig. 5.3, seventh to ninth lines: *"TTI#16 after one RTT, the HARQ entity again checks the original HARQ process and depending on whether PDCCH is received or not generates adaptive or non-adaptive retransmission"*).

With regard to feature D), i.e. determining for a particular TTI (i.e. "current transmission opportunity") of the TTI bundle to be re-transmitted whether or not the corresponding HARQ process should

generate a *non-adaptive* re-transmission of that TTI in the event that *no uplink grant* has been received on the PDCCH, D1 provides the following pseudo code describing the function of the responsible HARQ process (see page 4, last paragraph; emphasis added by the board), assuming that a TTI bundle is made up of four TTIs (see Fig. 5.3) and that "CURRENT\_TX\_NB" denotes the number of the TTI (e.g. "0, 1, 2, ...") currently used for transmission, while "CURRENT\_IRV" denotes the index of the presently used redundancy version of the HARQ process:

*"If the HARQ entity requests a retransmission, the HARQ process shall:*

- *increment CURRENT\_TX\_NB by 1;*
- *if ...:*
  - *for an **adaptive retransmission:***
    - *set CURRENT\_IRV to the value corresponding to the redundancy version indicated on PDCCH;*
    - *generate a transmission as described below.*
  - *for a **non-adaptive retransmission:***
    - *if ... or*
    - *if TTI bundling is configured and **CURRENT\_TX\_NB modulo 4 = 0** and the last feedback for this HARQ process is a **HARQ NACK;** or*
    - *if TTI bundling is configured and **CURRENT\_TX\_NB modulo 4 != 0:***
      - *generate a transmission as described below."*

That means that, according to D1, *only for the first* transmission opportunity (i.e. "TTI#16" corresponding to "CURRENT\_TX\_NB modulo 4 = 0" in the example of Fig. 5.3), i.e. for the initial TTI of a TTI bundle to

be re-transmitted, the actual determination whether or not a non-adaptive re-transmission for a certain TTI is to be generated is indeed dependent on the last received HARQ feedback (i.e. "HARQ NACK"), while for the following TTIs (i.e. "TTI#17", "TTI#18" and "TTI#19" corresponding to "CURRENT\_TX\_NB modulo 4  $\neq$  0") non-adaptive re-transmissions are automatically initiated, without taking into account the last received HARQ feedback (see also D1, page 4, paragraph beneath Fig. 5.3, tenth and eleventh lines: *"The only change required is to force non-adaptive retransmissions within a bundle even though no NACK was received"*).

As to features E) and F) of claim 1, D1 teaches that in the event that the last received HARQ feedback for a certain TTI bundle is a NACK signal (i.e. "HARQ NACK"), non-adaptive re-transmissions are generated for the first (and the subsequent) transmission opportunities (i.e. "TTI#16" to "TTI#19") of a bundle re-transmission. Although acknowledgement (ACK) signals are not explicitly mentioned in the pseudo code of D1 and, based on common sense, no HARQ re-transmissions at all - whether non-adaptive or adaptive - should typically be necessary upon receipt of such an "ACK signal", the appellant argued persistently at the oral proceedings before the board that, according to the underlying 3GPP standards, HARQ re-transmissions were also foreseen upon receipt of acknowledgement (ACK) signals as HARQ feedback and that therefore the above pseudo code applied equally to "HARQ ACK" signals. In favour of the appellant, the board adopts that assumption in the following. Accordingly, in D1's re-transmission scheme, if the last received HARQ feedback for a certain TTI bundle is *not* a "HARQ NACK" (i.e. being an "HARQ ACK" instead, in accordance

with the interpretation set out in point 2.2.1, last paragraph), non-adaptive re-transmissions are *not* generated for the *first* transmission opportunity ("TTI#16"), but are apparently (and surprisingly) still generated for the subsequent transmission opportunities ("TTI#17" to "TTI#19") of a bundle re-transmission (see in particular second and third "if" conditions of the above pseudo code's "non-adaptive retransmission" loop).

2.2.3 From the above it follows that the sole difference between the subject-matter of claim 1 and the disclosure of D1 is that

- i) the determining step is performed no matter whether the current transmission opportunity is a first transmission opportunity of the bundle re-transmission,

Put differently, present claim 1 is distinguished from D1 in that the UE has to determine for **each** TTI whether or not the last received feedback of the HARQ process is a NACK signal, rather than performing the check only for the *first* TTI of the re-transmitted TTI bundle, as proposed by D1. Hence, the subject-matter of claim 1 is considered to be novel over D1 (Article 54 EPC).

2.2.4 According to the present application, the solution claimed prevented the HARQ process from generating unnecessary re-transmissions and thus enhanced system efficiency (cf. page 7, lines 19-21 of the application as filed). However, the board understands from the present application and document D1 that, upon receipt of a "HARQ NACK" and in the absence of any "uplink grant", non-adaptive re-transmissions of a TTI bundle have to be generated anyway according to the underlying

3GPP standards, whether checked only for the first TTI or also for the follow-up TTIs (see e.g. D1, section 2, first item: "within a bundle, all retransmissions are non-adaptive" and second item: "the retransmission of a bundle is also a bundle"). So, in that case, feature i) does not yield a technical effect other than increasing the processing overhead (due to unnecessary, continuous NACK checks for each TTI) and/or interfering with transmissions of other HARQ processes (e.g. with the TTIs of TTI bundles 1, 2 or 3 according to Fig. 5.3 of D1), thereby, and contrary to the present invention's alleged aim, even aggravating the issue of data collisions within the wireless system under consideration. Rather, the board holds that the measure according to distinguishing feature i) is only meaningful and beneficial in the case where an "HARQ ACK" is received as a last feedback of the corresponding HARQ process. Only then could the continuous checks of the last HARQ feedback credibly lead to the desired results.

The objective technical problem to be solved by claim 1 may therefore be formulated as "how to avoid that, in the event that the last received HARQ feedback is an ACK signal, the transmission unit of D1 performs unnecessary and collision-prone TTI re-transmissions".

- 2.2.5 The board first notes that adapting or improving a certain proposal to a telecommunication standard in view of all likely scenarios (e.g. receipt of an ACK signal, besides a NACK signal, as HARQ feedback) constitutes a task with which a skilled person working in the field of 3GPP-based wireless systems may reasonably and realistically have been faced at the application's priority date. When confronted with the objective technical problem and considering the case of

receipt of an ACK signal as a last received HARQ feedback, the skilled person would immediately notice that, based on the pseudo code set out in D1, the initial TTI (e.g. "TTI#16" implying "CURRENT\_TX\_NB modulo 4 = 0") of a TTI bundle (i.e. "bundle 0") to be re-transmitted would be subject to neither non-adaptive nor adaptive re-transmission, whereas the subsequent TTIs ("TTI#17" to "TTI#19" implying "CURRENT\_TX\_NB modulo 4  $\neq$  0") would indeed be subject to non-adaptive re-transmissions. This would in turn lead to the entirely undesirable situation where the first TTI of a particular TTI bundle is *not* re-transmitted at all, while the remaining TTIs of that bundle are in fact unnecessarily re-transmitted, contrary to the overarching requirement of D1's proposal according to which "the retransmission of a bundle is also a bundle" (see in particular page 1, section 2, second item).

The board further believes that, in order to avoid such an undesirable situation and to solve the above objective problem, the skilled person would have only two viable solutions at hand, namely *either* treating each TTI independently of the other TTIs of any TTI bundle *or* establishing for each TTI of a TTI bundle to be re-transmitted whether or not the last received HARQ feedback was an "HARQ NACK". The first option would inevitably imply that the bundling concept would have to be dispensed with. This would, however, clearly be at odds with the overall teaching of D1, which exclusively and consistently relies on TTI bundling (as its title "Bundling Issues" already suggests). That conclusion is also underpinned by the appellant's statement made at the oral proceedings before the board that the skilled person would never change the bundling concept of D1 since the latter ensured better signal



quality.

On the other hand, the second option, which corresponds to the solution according to distinguishing feature i), represents a technically sound and easily implementable measure to the skilled person, simply requiring that, for any TTI of a TTI bundle to be re-transmitted, the corresponding check is done, i.e. that, in the language of D1's pseudo code, the second and third "if" clauses of the "non-adaptive retransmission" loop are merged into one "if" condition, thus reading

*"- if TTI bundling is configured and  
CURRENT\_TX\_NB modulo 4 = 0 or CURRENT\_TX\_NB  
modulo 4 != 0 and the last feedback for this HARQ  
process is a HARQ NACK;  
- generate a transmission as described below."*

By that minor modification of D1's re-transmission scheme, the skilled person, applying his/her common general knowledge, would eventually arrive at the solution of claim 1 in an obvious manner.

2.3 In conclusion, present auxiliary request 1 is not allowable under Article 56 EPC.

3. REMAINING CLAIM REQUESTS

3.1 Claim 1 of the other claim requests on file (i.e. main request, new auxiliary requests 1 to 3 and auxiliary requests 2 and 3) differ from claim 1 of auxiliary request 1 essentially in that

*G) features E) and F) are not included (in main request, auxiliary request 2 and new auxiliary requests 1 to 3);*

- H) the current transmission opportunity is defined as "current transmission opportunity of the bundle retransmission" (*in new auxiliary requests 1 and 3*);
- I) the determining step is performed "for all transmission opportunities of the bundle retransmission" (*in new auxiliary requests 2 and 3*);
- J) the phrase "when no uplink grant for the current transmission opportunity has been received on the PDCCH" is no longer included in feature D) (*in auxiliary requests 2 and 3*).

3.2 Hence, as the other claim requests are broader in scope than auxiliary request 1, with the definitions according to amendments H) and I) having already been taken into account in the assessment of novelty and inventive step as regards that request (cf. point 2.2.1 above), the board concludes that, *a fortiori*, the subject-matter of claim 1 of the remaining claim requests lacks an inventive step, based on the reasons set out in point 2.2 above.

3.3 Consequently, the present main request, new auxiliary requests 1 to 3 and auxiliary requests 2 and 3 are not allowable under Article 56 EPC either.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chair:



L. Malécot-Grob

A. Ritzka

Decision electronically authenticated