TSG RAN Meeting #19 **RP-030150**

Birmingham, United Kingdom, 11 - 14 March, 2003

Title	**Early UE – Proposal for UESBI-Iu encoding**
Source	**Siemens, Qualcomm**
Agenda Item	**9.9.11**

1 Introduction

In [12] TSG SA WG2 approved an LS to RAN where it is indicated that despite the missing decision on the actual content of UESBI-Iu the work on early UE proceeded, however this lack of decision caused *some difficulties and delays to the SA 2* work.

SA2 further states that any delay of the decision on RAN level will become critical at SA2 #31 (Korea, 7-11/4/03) as finalisation of the early UE TS and stage 3 work in CN1 and CN4 is required and therefore *kindly request TSG-RAN to make a decision between "bitmap" and IMEISV during their March 2003 TSG meeting*.

In the light of this situation this paper is the re-submission of parts of [13] presented at the early UE adhoc in January 2003, urging a decision at RAN#19 (the reader may take the analytic approach and follow the complete document or skip section 2.2 - and even 2.1):

This document starts with addressing different possibilities of encoding the information given on Iu for early UE handling in UTRAN in section 2.1. In section 2.2 it compares these possibilities w.r.t. requirements stated already in recent meetings or at this meeting. Finally conclusions are drawn and a proposal how to implement the decisions in 25.413, 25.994 (ref.[8]) and 25.995 (ref.[15]) is made.

Further, this document stresses the fact that the plain decision on whether IMEI-SV or a bitmap shall be sent on Iu is only half the way, as in case the bitmap is chosen, the encoding of the bitmap is still needed, e.g. to specify length of UESBI-Iu in RANAP, also to avoid lengthy discussion during future standardisation meetings.

2 Discussion

2.1 Methods to encode the Iu info

a) Iu info = IMEI SV

The first possibility represents the method where the bitstring on Iu (i.e. the content of the UE specific behaviour indicator) represents the IMEI-SV and the RNC activates special network (UTRAN) treatment for certain IMEI-SV (in fact TAC and SV) ranges.

b) Iu info = bit-position within a bitstring indicates absence/presence of UE faults

The second possibility represents the method where a bitmap on Iu indicates (corrected) UE faults by setting certain well defined bit-positions within an bitstring. The RNC activates special UE treatment according to the bit pattern.

The impossibility to estimate the amount of failures would in principle mean to define either a bitstring with undefined length or define a bitstring of 'sufficient' length on Iu.

c) Iu info = timestamp of UE shipping/manufacturing/UE test-state

This possibility refers to a method where the information given on Iu distinguishes the UEs by e.g. their compliance to a test-specification (i.e. the date when a certain version of the test-specification has been endorsed). Alternatively the timestamp could indicate the assembling/shipping date of the UE.

d) Iu info = pointer to certain versions of the TRs 25.994/25.995 (ref.s [8] & [15])

This possibility foresees that the bitstring on Iu refers to certain versions of the TRs in ref's [8] & [15]. Whenever this version indication is received, UTRAN shall assume that the concerned UE either corrected all the issues reported in the indicated version of the TR or never implemented the reported failure.

Estimating a minimum version-update period of one month and a lifetime of the TRsreport of 20 years gives 1 byte to be sufficient to carry the expected maximum amount of TR versions.

In case the version indication is received in UTRAN via more than one interface (this depends on the final solution for certain mobility scenarios) the higher version indication shall take precedence.

e) combination of b) and d), i.e. pointers to certain versions of TRs [8] & [15] with the possibility to indicate single failures of recent TR versions.

This possibility combines the method described in b) and d). I.e. a specific number of bits are referring to certain versions of the proposed TRs [8] & [15]. Again whenever this version indications are received, UTRAN shall assume that the concerned UE either corrected all the issues reported in the indicated versions of the TRs or never implemented the reported failure. Additionally a specific number of bits are reserved, where each bit position represents the absence/presence of a specific UE behaviour. This combination will allow addressing each detected failure individually for a certain period of time. The length of this time period may be discussed further, but will be limited by the length of the failure-bitmap.

The combined method allows the possibility to force specific failures to be corrected in the UE after a certain time period, while at the same time a limited number of failures can be distinguished individually.

2.2 Requirements wrt the Iu i/f mechanism

This section gives an overview of all the requirements for early UE handling stated either explicitly or implicitly in various documents submitted to RAN#18 and to this RAN Adhoc (see references).

Discussion on requirements may seem to be a bit late at this stage of discussion, however, such discussions never took place in RAN groups. Also this contributions tries to list and evaluate all requirements given so far in order to provide a comprehensive picture. Evaluations have been performed in SA2 as well, but the chosen criteria's for SA2's assessment covers only partly RAN concerns. At least this section may assist in deciding one of the methods under discussion.

With respect to standard corrections it is worth to note, that any correction to the standard will imply that a new "correction feature" will be introduced. In fact this feature will have to be able to interact with already standardised mandatory and optional features.

The compiled requirements are summarised below:

The early UE mechanism(s)

1) shall facilitate segregation of faulty mobiles. (H3G, Orange, Nokia), existing Rel'99 functionality shall not be disabled due to the adding of error handling mechanisms (Nokia)
2) shall provide means for operators to take contingency measures in the event of deadlock situations (H3G) and shall be able to solve faults rapidly (Vodafone, NEC, Nortel, Siemens, see section 2.4 of this paper)
3) shall ensure global roaming (Nokia, Siemens) and shall not encourage proprietary implementations (Siemens)
4) shall ensure maintenance of open interfaces
5) shall be able to handle faults in relation to inter-system handover (Vodafone) even in the early signalling phase at GSM->UMTS HO (Nokia)
6) shall be limited to faulty UE implementations due to possible ambiguities or faults in the standard or due to insufficient test-coverage (Siemens)
7) shall not prevent to introduce corrections/clarifications in the respective specification(s).(Siemens)
8) shall minimise implementation and maintenance effort in CN and UTRAN. (Siemens) (assuming only standardised workarounds implemented)
9) shall only be used to solve failures which are published within 3GPP and which have agreed workaround solutions (Siemens).

   shall ensure that discussions on early UE problems are kept inside 3GPP (Nokia, Orange, Siemens, Vodafone, Alcatel)

   shall ensure that agreed solutions are reported in a TR (Nokia, Orange, Siemens) Validated UE behaviour should be documented in the standards, together with recommended handling of the behaviour. This should result in common behaviour of UEs in the long term, with consistent handling across networks aiding roaming (Vodafone).

10) shall result in common behaviour of UEs in the long term (Vodafone), i.e. avoid that a correction becomes a new long term correction feature (Siemens)

11) the handling should not imapct the CN implementations and CN protocols. (Nortel, NEC)

12) handling of UE faults shall be decoupled, i.e. fault should be treated individually. (Nortel, NEC)

13) handling of UE faults shall be treated like other corrections of the standard and follow the same procedure (Nortel, NEC)

Assessment of the encoding possibilities of the Iu bitstring along the requirements

Methods:	a. IMEI-SV	b. bit-position indicates UE fault	c. timestamp	d. TR version	e. TR version + bitstring of recent failures
1) segregation of faulty mobiles existing Rel'99 functionality shall not be disabled	?	?	?	?	?
2) provide means for operators to take contingency measures rapid handling	depends on the one hand on the willing to have standardised solutions on the other on the speed of discussions				
3) ensure global roaming shall not encourage proprietary implementations	depends again on the willing to have discussions inside 3GPP, however, the solutions differ w.r.t the motivation to treat problems within 3GPP. proposed ranking: d > e > c > b > a				
4) shall ensure openness interfaces	Note, that *open interface* not only relates to signalling on a certain interface but also on the functionality triggered by information sent on that interface. With respect to 'open functionality', the proposed ranking is the same as for 3).				
5) shall be able to handle faults in relation to inter-system handover even for failures in the early signalling phase of ->UMTS HO	?	?	?	?	?
6) scope limited to faults due to ambiguities/faults in the standard and insufficient test-coverage	proprietary support of non standardised implementations possible	proprietary support limited with the proposed ranking as in 3)			
7) shall not prevent to introduce corrections/clarifications in the respective specification(s).	?	?	?	?	?

8) minimise implementation and maintenance effort in CN and UTRAN	equal	
9) shall only be used to solve failures which are published within 3GPP and which have agreed workaround solutions discussions on early UE problems kept inside 3GPP solutions to be reported in a TR	violation difficult/not to be detected	violation can be detected
10) shall result in a common behaviour of UEs in the long term shall avoid that a correction becomes a new long term correction feature (i.e. ensure that all UE vendors perform the corrections)	danger of different network corrections	b) – e) ensure the requirements with the ranking d > e > c > b
11) shall not impact the CN implementations and CN protocols	common to all method is that the Iu interface has to implement once a container. Then a) – e) are equal wrt this requirement	
12) handling of UE faults shall be decoupled, i.e. fault should be treated individually	may contradict requirement 10)	
13) handling of UE faults shall be treated like other corrections of the standard and follow the same procedure	not dependent on the actual solution	

3 Conclusions

With respect to the table above and the discussions held at RAN#18, it seems that method a) (IMEI-SV on Iu) has drawbacks with regards to risk of proprietary handling outside 3GPP. Technically speaking, methods a) to e) 1 and 2 are equal.

4 Proposal

The following is proposed

1. **to agree on a Iu based solution where the bitstring do not directly indicate the IMEI-SV or single failures** (i.e. failures reported in TR 25.994 and TR 25.995).
2. **to agree on the principles of the method e).** However final decision on the number of individually failures to be treated as well as the time period for increasing the version number of the report shall not be taken yet. It is suggested to allow further discussion on these details as soon as first failures are detected.
3. **to decide to modify the RAN3 CR in [14] in the following way**

9.2.1.59 UESBI

The purpose of the *UESBI* IE is to transfer the UE Specific Behaviour Information as defined in [31] and [32] from the CN to the RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UESBI	M		BIT STRING (32)	Contents defined in [31] and [32].

9.3.4 Information Element Definitions

```
UESBI ::= BIT STRING (SIZE (32))
-- Reference: TR25.994 and TR25.995
```

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4. **to capture method e) in TR 25.994 in the following way:**

7.2 RANAP Information Elements

~~*<semantics and coding descriptions>*~~

The information element in RANAP indicating specific UE behaviour is an BIT STRING (SIZE(32)).

These 4 Octets shall be encoded as follows:

7	6	5	4	3	2	1	0
eBI(1) 8	eBI 7	eBI 6	eBI 5	eBI 4	eBI 3	eBI 2	eBI 1
25.994 Version Indicator(2)							
sBI(3) 8	sBI 7	sBI 6	sBI 5	sBI 4	sBI 3	sBI 2	sBI 1
25.995 Version Indicator(4)							

(1) If *eBI n* (early Behaviour Indicator n) is set to "0" the UE implemented the described correction of TR 25.994 *eBI n* is pointing at.

eBI 1 points at the correction described in the highest subchapter of section 8 of the indicated version of TR 25.994, *eBI 2* points at the subchapter with the subchapter number which is one less then the highest, etc.

(2) The *25.994 Version Indicator* is the version of TR 25.994 UESBI points at in order to describe specific behaviour of the concerned UE. The mapping between the value of the Version Indicator and the actual version of the TR 25.994 is defined in the indicated version.

(3) If *sBI n* (superseded Behaviour indicator n) is set to "0" the UE implemented the described correction of TR 25.995 *sBI n* is pointing at.

sBI 1 points at the correction described in highest subchapter of section 8 of the indicated version of TR 25.995, *sBI 2* points at the subchapter with the subchapter number which is one less then the highest, etc.

(4) The *25.995 Version Indicator* is the version of TR 25.995 UESBI points at in order to describe specific behaviour of the concerned UE. The mapping between the value of the Version Indicator and the actual version of the TR 25.995 is defined in the indicated version.

4a & 5.a Another possibility would be to describe the structure of the UESBI in RANAP in the following way:

this possiblity would have the advantage that the semantics and the structure of UESBI is specified at a central point and doesn't need to be spread over [8] and [15]

9.2.1.59 UESBI

The purpose of the *UESBI* IE is to transfer the UE Specific Behaviour Information as defined in [31] and [32] from the CN to the RNC.

IE/Group Name	Presence	Range	IE type and reference	Semantics description
UESBI failure map TR 25.994	M		BIT STRING (8)	Each bit points at a correction described in a subchapter of section 8 of the version (indicated in *version indicator TR 25.994*) of TR 25.994. BIT 0 points at the highest subchapter of section 8 of the indicated version of TR 25.994, BIT 1 at 2nd highest subchapter, etc. The order of bits is to be interpreted according to subclause 9.3.4. Indicated behaviour in [31]
version indicator TR 25.994	M		OCTET STRING (1)	The *25.994 Version Indicator* is the version of TR 25.994 UESBI points at in order to describe specific behaviour of the concerned UE. The mapping between the value of the Version Indicator and the actual version of the TR 25.994 is defined in the indicated version. Contents defined in [31].
UESBI failure map TR 25.995	M		BIT STRING (8)	Each bit points at a correction described in a subchapter of section 8 of the version (indicated in *version indicator TR 25.995*) of TR 25.995. BIT 0 points at the highest subchapter of section 8 of the indicated version of TR 25.995, BIT 1 at 2nd highest subchapter, etc. The order of bits is to be interpreted according to subclause 9.3.4. Indicated behaviour in [32]
version indicator TR 25.995	M		OCTET STRING (1)	The *25.995 Version Indicator* is the version of TR 25.995 UESBI points at in order to describe specific behaviour of the concerned UE. The mapping between the value of the Version Indicator and the actual version of the TR 25.995 is defined in the indicated version. Contents defined in [32].

9.3.4 Information Element Definitions

```
UESBI ::= SEQUENCE {
    failure-map-25994         UESBI-Iu-failure-map,
    version-indicator-25994   OCTET STRING (SIZE(1))
    failure-map-25995         UESBI-Iu-failure-map,
    version-indicator-25995   OCTET STRING (SIZE(1))
    }
```

```
-- Reference: TR25.994 and TR25.995

UESBI-Iu-failure-map ::= BIT STRING {
                                    indicator1(0),
                                    indicator2(1),
                                    indicator3(2),
                                    indicator4(3),
                                    indicator5(4),
                                    indicator6(5),
                                    indicator7(6),
                                    indicator8(7)
                                    } (SIZE (8))
-- Reference: TR25.994 and TR25.995
```

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5 References

[1] RP-020817, Handling of Early Mobiles, 3

[2] RP-020818, Early Mobile Handling, Orange

[3] RP-020856, Early UE handling, Nokia

[4] RP-020886, Proposal for Early UE handling, Vodafone

[5] RP-020867, Requirements to Handle early UEs, Alcatel

[6] RP-020881, Proposed Content for the early UE RAN TR – Problem Statement, Siemens

[7] RP-020882, Proposed Content for the early UE RAN TR – Requirements, Siemens

[8] TR 25.994, Recommended measures in UTRAN to overcome early User Equipment (UE) implementation faults, Version 0.0.0

[9] RPA030004, Efficient handling of early mobiles with the UTRAN, Vodafone

[10] RPA030011, Early UE handling, Nokia

[11] RPA030012, Process to handle early UEs in RAN, NEC, Nortel

[12] S2-031004 (RP-030164), LS on early UE handling, TSG SA2, (To: RAN, CC: SA, RAN2, GERAN, CN, CN1, CN4, RAN3)

[13] RPA-030010, Early UE – Proposal for further work, Siemens

[14] RP-030086, CRs (R99 and Rel-4/Rel-5 Category A) for Early UE handling in UTRAN to 'Transfer UESBI over Iu', RAN WG3

[15] TR 25.995, Measures employed by the UMTS Radio Access Network (RAN) to cater for legacy User Equipment (UE) which conforms to superseded versions of the RAN interface specification