TSG-RAN Working Group 3 meeting #2 **TSGW3#2(99)165**

Nynäshamn, Sweden, 15th - 19th March 1999

Agenda Item: 7.6 General Aspects and Principles of Iur interface (S3.20)

Source: Siemens, Italtel

Title: **Drawbacks of Common Channels on Iur**

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1 INTRODUCTION

The current working assumption in RAN WG3 is, that common channels shall be supported over Iur. This was decided in the SMG2 UMTS-ARC meeting #7, assuming that the complexity of the solution is not prohibitive. In the meantime, it was stated that the benefit of such mechanisms outweighs the drawbacks of the additional complexity in the UTRAN Tdoc SMG2 UMTS-ARC 380/98, Common Channels in Iur interface, Source: Nokia. This contribution demonstrates the drawbacks implicit in the present assumption and the advantage deriving from its modification.

Tdoc SMG2 UMTS-ARC 380/98, Common Channels in Iur interface, Source: Nokia shows that no support of common channels on Iur is necessary when an SRNC relocation is performed before a UE changes to a common channel state and when an SRNC relocation is performed with an Inter-RNC Cell/URA Update. This is already foreseen in TSG-RAN Working Group 3: Merged Description of Iur Interface, V0.0.2 1999-02, Source: Editor.

Figure 1 shows the split of the MAC entity which follows from the current working assumption. MAC-c and MAC-sh will be located in the DRNC and MAC-d and RLC in the SRNC. The MAC Control SAPs are not shown, but MAC control may also become more complex when the MAC is split.

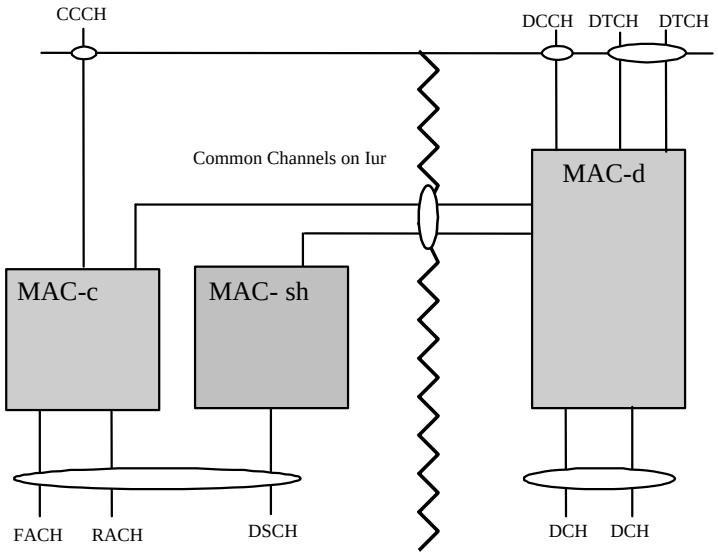

Figure 1: Split of the MAC entity when common channels have to be supported
(according to the current working assumption)

Remark: The term "common channels on Iur" refers to the support of common channels in the user plane of Iur. Not to have "common channels on Iur" does not imply that RNSAP signalling messages concerning common channels may not be exchanged over the Iur.

2 DISCUSSION

2.1 Impact on Implementation and Standardisation

The task of standardisation is to provide specifications of protocols and interfaces. To this end, models of functional entities are needed which provide an external view of these entities. Often internal structures are part of those model. They help to define an external view while allowing implementation flexibility. Such an approach ensures that manufacturers have enough freedom to implement systems in an efficient way, and thus gives them the possibility to distinguish themselves from competitors. Usually, protocols are defined in layers which are accessible via service access points. Different protocol entities of the same layer exchange peer-to-peer protocol data units via underlying layers. The working assumption to have common channels on Iur leads to a split of functionality of a MAC entity between SRNC and DRNC. It separates the MAC-c and the MAC-sh functionalities from the MAC-d and the RLC. Interactions with MAC-d have to be performed via an open interface. This adds significant complexity to the Iur and to the implementation of the MAC layer. Furthermore, it limits the freedom to implement an efficient protocol stack consisting of RLC and MAC, as interactions within this stack have to be performed via an open interface and have to be predefined in the standards. The internal structure of the MAC model is not used to describe the external behaviour of the MAC entity, but defines the requirements put on the Iur interface.

To introduce an additional interface – like the Iur – into a network architecture has to be justified by significant gains. The main purpose of the Iur is to support diversity branches for dedicated channels in FDD. Thus, standardisation should aim at a simple interface to support this feature. The support of common channels on Iur makes the interface much more complex without providing any significant gains in terms of service quality.

2.2 Impact on Standardisation of Core Network functions

The support of common channels on Iur does not reduce the required set of functions to be standardised. The core network has to support the case that no Iur between two RNCs exists. These mechanisms can be used for handover when the working assumption is dropped. In the case when an Iur exists and the working assumption is dropped, common channel signalling over Iur can still be used to support Cell/URA Updates.

2.3 Impact on Performance Requirements put on the Core Network.

As described in Tdoc SMG2 UMTS-ARC 380/98, Common Channels in Iur interface, Source: Nokia, a UE that is in RACH/FACH state, 1) is connected to a 3G SGSN, 2) is not connected to a 3G MSC, 3) uses a best-effort NRT service, **and** 4) is in a period with low or zero activity. In such a case, no exceptional performance requirements are put on the Cell/URA Update procedure. TSGWG3#1(99)081: Common Channels on the Iur, Source: Alcatel points out that the break in transmission is longer when SRNC relocation is synchronised with Cell/URA Update compared to the case where no SRNC relocation is performed and common channels on Iur are supported. In principle, this observation is correct, but an additional fact has to be taken into account. This is when the duration of the break in transmission is not critical, since there is only low or zero activity and the provided service is best-effort NRT. The same is basically true for a UE using a DSCH. Though the NRT traffic may have a higher volume, there are still no stringent delay requirements and the handover procedure can be performed in backward direction (HO A1 according to UMTS 23.10, version 1.0, UMTS Access Stratum; Services and Functions), which significantly eases the performance requirements put on the core network functions.

The only potential benefit of the support of common channels on Iur is, that a few SRNC relocations may be saved in the case where a UE very frequently changes between RNCs (“ping-pong effect”). In any other case, a Cell/URA update which is not accompanied by an SRNC relocation will usually result in an unsynchronised SRNC relocation shortly afterwards. Thus, neither the rate of SRNC relocations nor the complexity of the overall protocol scenarios will significantly be reduced by the support of common channels on Iur.

2.4 Impact on Network Dimensioning

The support of common channels on Iur put additional load on the Iur. Signalling and user traffic between MAC-d and MAC-c/MAC-sh have to be carried over the interface. Dimensioning the Iur for traffic on dedicated channels is already difficult enough. Traffic between MAC-d and MAC-c/MAC-sh is even less predictable. Compared to Iu less bearers are transported, so less “trunking gain” can be achieved. For DSCH Tdoc SMG2 UMTS-L23 042/99, Comparison of alternative DSCH structures, Source: Nokia proposes to use peak bitrate allocation on Iur. Thus, dimensioning of Iur capacity has not only to take additional load into account but also becomes more complex.

It should also be noted that additional delay is introduced when user traffic has to be handled in the MAC of the DRNC.

2.5 Examples which show the additional complexity introduced by common channels on Iur

Each MAC-c and MAC-sh instance has to handle relations with several SRNCs and has to be maintained according context information (e.g. Iur bindings).

In Tdoc TSGWG3#1(99)033: CCH Procedures over Iur, Source: Nortel several procedures are proposed which are needed to support common channels on Iur. The contribution focuses MAC-c. It covers additional procedures for the request, modification and release of common channel resources in MAC-c. Similar procedures will be required for MAC-sh.

The split of the MAC entity makes scheduling more difficult. Several Buffers are required. In Tdoc TSGWG3#1(99)033: CCH Procedures over Iur, Source: Nortel some new mechanisms are proposed to deal with the problem. Priorities may be assigned to a traffic flow (though not to individual MAC-PDUs) and a time-to-live parameter is assigned to each MAC-d PDU. It is not yet clear, if this is sufficient to deal with the problem. E.g., no information about the current status of a buffer in transferred from MAC-c to MAC-d or vice versa.

The fact, that MAC-d PDU may be discarded in MAC-c when the time-to-live has run out, may cause additional problems, and it might become necessary to signal this event back to the MAC-d.

In addition some information from MAC-c may be required to decide whether a UE should switch to the DCH state. When such a switch is performed, the transfer of some context information from the (old) MAC-c/MAC-sh entity to the MAC-d may be required.

To rule the transmission of MAC-d PDUs to MAC-c, some kind of flow control will be required. How this can be achieved is not yet clear. In Tdoc TSGWG3#1(99)033: CCH Procedures over Iur, Source: Nortel a procedure called ‘Downlink Flow Control’ is introduced. This procedure can not be regarded as a proper flow control mechanism. It should be called ‘Downlink Congestion Control’ because it used dedicated messages to indicate that a MAC-c instance is congested. Flow control mechanisms have to be performed per traffic channel and need constant update of state information at both ends. This could for example be achieved by using window mechanism or by sending credits from MAC-c to MAC-d, possibly using some kind of in-band signalling.

All these examples show, that it is a highly sophisticated and demanding task to define, evaluate, implement, dimension, and manage these new mechanisms on the Iur.

3 CONCLUSION

The additional of common channels on Iur means that the standardisation, implementation, network dimensioning and network management is overly complex. The small gain that may be obtained by de-coupling cell updates and hard handovers for NRT services (in a state of little or no activity) from SRNS relocations in the core network is difficult to justify. The curt time frame that is set for standardisation, implementation and deployment of UTRAN does not facilitate features that have little or no system benefit.

Siemens and Italtel would like to see the working assumption to support common channels in the user plane of Iur to be removed from the specifications. However, as some companies maintain an insistence on the working assumption, we could agree to compromise in the definition that **the support of common channels on Iur is optional**. In TSGWG3#1(99)081: Common Channels on the Iur, Source: Alcatel, (not presented/discussed), it states that the optionality is already implied in the current working assumption, however, the current specification does not explicitly reflect this. Therefore, we believe that explicitly defining this proposal clears any ambiguity in the specifications. In addition, the proposal promotes a flexible network configuration that will reduce both manufacturing and operating costs.

4 PROPOSAL

At the end of section 6.2 of TSG-RAN Working Group 3: Merged Description of Iur Interface, V0.0.2 1999-02, Source: Editor, which will presumably be copied to section 4.4 of TS S3.20: Iur Interface: General Aspects and Principles, the following text shall be added, so that transfer of RACH, FACH, and DSCH data streams is marked as optional:

The support of common channels on Iur, i.e. Iur RACH data streams (3.), Iur FACH data streams (4.), and Iur DSCH data streams(5.), is an option.

5 REFERENCES

[1] TSG-RAN Working Group 3: Merged Description of Iur Interface, V0.0.2 1999-02, Source: Editor

[2] TSGWG3#1(99)081: Common Channels on the Iur, Source: Alcatel, (not presented/discussed)

[3] Tdoc SMG2 UMTS-ARC 380/98, Common Channels in Iur interface, Source: Nokia

[4] Tdoc TSGWG3#1(99)033: CCH Procedures over Iur, Source: Nortel, (not presented/discussed)

[5] UMTS 23.10, version 1.0, UMTS Access Stratum; Services and Functions

[6] Tdoc SMG2 UMTS-L23 042/99, Comparison of alternative DSCH structures, Source: Nokia

[7] TS S3.20: Iur Interface: General Aspects and Principles