TSG-RAN Working Group 3 meeting #4 ***TSGR3#4(99)495***

Warwick, UK, 1 - 4 June 1999

Agenda Item: 13.1 General Aspects and principles of Iur interface (25.420)

Source: Siemens, Italtel

Title: Operation of UTRAN without user plane traffic over Iur

Document for: Discussion and Approval

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1 INTRODUCTION

Procedures for the support of DCHs and Common Transport Channels over Iur will be standardised in TSG RAN WG3. However, it is FFS whether these procedures shall be optional or mandatory. This contribution shows that in several cases it can be beneficial to operate a UTRAN without sending user plane traffic over the Iur. Therefore, we propose that the specifications of UTRAN shall be defined in a way which does not preclude operation without user plane traffic over Iur. Furthermore, the support of DCHs and Common Transport Channels over Iur should be specified as optional, especially for TDD-only networks.

2 DISCUSSION

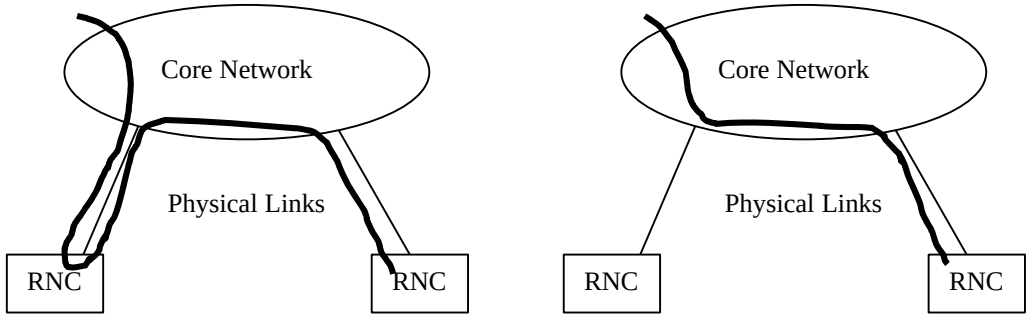
2.1 Pros and cons of user plane traffic over Iur

The Iur is a new type of interface which did not exist in second generation mobile communications systems. To introduce an additional interface into a network architecture adds complexity to the standardisation process, to the protocol implementation, to network dimensioning and to O&M. Initially, the Iur was introduced for FDD systems to allow macro-diversity between cells which are controlled by different RNCs. This may be justified by the reduction of interference between such cells. An additional benefit of the user plane traffic on Iur is that inter RNC mobility can be hidden from the core network. This has the advantage that handover and SRNS relocation can be de-coupled and it is especially useful in the case when a UE changes frequently (‘ping-pongs’) between two cells which belong to different RNCs and when the core network has problems in performing the according handovers / SRNS relocations.

As already described in [1], proper dimensioning of an Iur is a complex task. If user traffic on Iur can be avoided, network dimensioning becomes simpler. Also, the network architecture becomes simpler, which simplifies operation, administration and maintenance of the network.

If no macro-diversity branches exist in cells controlled by the SRNC and if the Iu and Iur traffic is carried over the same physical interface, the amount of traffic on the physical interfaces per bearer over the Iur is approximately tripled compared to a situation where an early SRNS relocation is performed. Figure 1 illustrates this. If user traffic on Iur can be avoided for the cases where no macro-diversity between RNCs is required, capacity on the physical interfaces can be saved.

In addition, if the core network is able to perform some kind of route optimisation, an early SRNS relocation helps to save capacity in the core network.



(a) User Traffic on Iur (b) No User Traffic on Iur

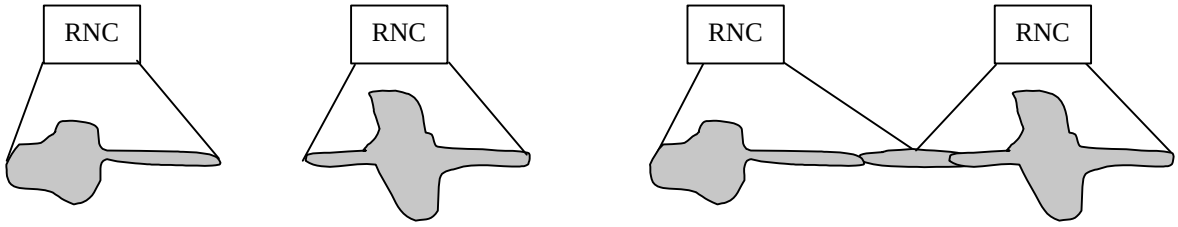
Figure 1: Traffic over physical interfaces which carry Iu and Iur, when a UE is only connected to one RNC.
Case (a): Iu is still with old RNC
Case (b): Iu has been transferred to the new RNC

2.2 TDD-only systems

Since a TDD-system does not need macro-diversity for the reduction of inter-cell interference, the main reason for user traffic on Iur (the support of macro-diversity) does not exist in such a system. Furthermore, due to the implementation of slow DCA algorithms, a TDD-system can better prevent the so-called 'ping-pong effect'. Thus, also the second advantage of user traffic on Iur (hiding RNC mobility from the core network) loses its relevance. From this follows that a TDD-only system can easily live without the support of user traffic over Iur. Since a simpler network architecture has several advantages, it should be possible to operate such a system without the support of user traffic over Iur.

2.3 Network evolution aspects

For systems which support FDD and/or TDD, it can be beneficial to be able to operate them without the support of user traffic over Iur. It is e.g. expected, that UMTS will be introduced by starting with UMTS islands, i.e. geographical coverage areas which are isolated from other coverage areas. In the beginning, such an UMTS island will typically be served by a single RNC. In that case, no user traffic will be carried on any Iur and the according functionality needs not to be present in the RNC. As the UMTS islands grow in size, they may touch cells which belong to other UMTS islands (see figure 2). Of course, handover between the (former) islands should be possible from the beginning.



(a) first (b) later

Figure 2: UMTS island growing together

From this follows that at the beginning of the UMTS introduction, the Iur functionality may not be needed. Thus, the support of user traffic over Iur is not required. In a later phase, when areas covered by different RNCs begin to join, handover between these areas shall be supported by signalling over Iur. However, since the RNC areas may only touch at a few geographical points, the full support of user traffic on Iur is still not required. In order to keep the network architecture simple, the operation without the support of user traffic over Iur should be possible in such a case. Thereby, the inter-RNC handovers should not be precluded by the missing support of user traffic over Iur.

2.4 Large RNC Areas

The same arguments as presented in section 2.3 hold for the case, where large RNC areas only touch in geographic regions, where only little user traffic is expected. Since the size of a UMTS cell is limited, more bandwidth may be available in these regions than actually needed. In such a case, the reduction of inter-cell interference is not of a high priority and may not justify operation of a full Iur. Furthermore, Inter-RNC handovers / SRNS relocations may occur relatively seldom and the core network should be able to handle these without any performance problems.

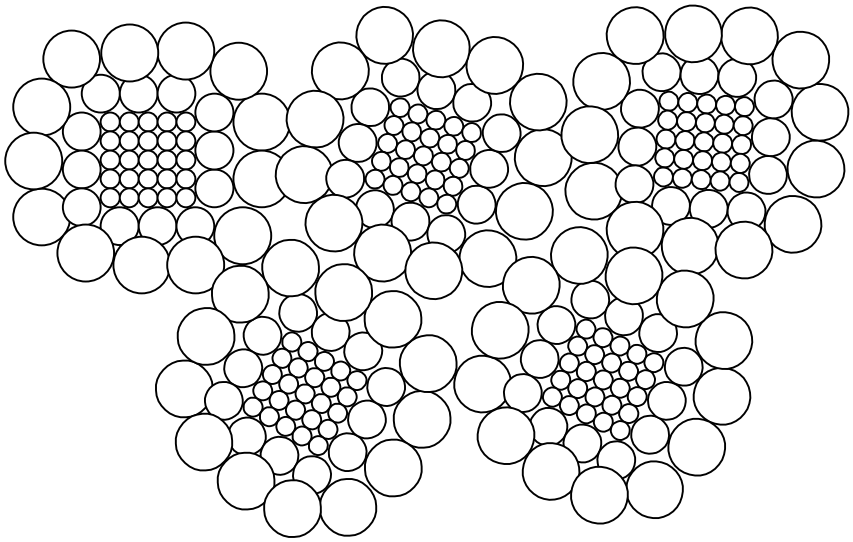


Figure 3: Large RNC areas touching at points with little expected user traffic (principle)

3 PROPOSAL

3.1 Do not rely on user traffic on Iur

In order to enable the operation of a network which does not support user traffic over Iur the inter-RNC procedures Cell Update, SRNS Relocation, and Hard Handover should be specified in a way so that they do not rely on the transport of user traffic over Iur. This seems currently to be the case. However, this principle should be used as a guideline, when defining these procedure in more detail.

3.2 Optional for TDD

Since TDD systems do not rely to the same extent as FDD systems on the support of user data traffic on Iur and since this can be regarded as an additional feature and not as an essential function, the support of user data traffic on Iur should be "`optional for TDD`" in [2].

3.3 Optional Common Transport Channels for FDD

Since the support of Common Transport Channels over Iur adds complexity to operation, administration and maintenance of a network (as described in [1]) and since this function does not increase spectrum utilisation, it can be regarded as an additional feature which does not need to be present in every RNC. Therefore, the support of "`common transport channels`" on Iur should be defined as "`optional for FDD`" in [2].

4 REFERENCESDS

[1] TSGR3#1(99)043, Drawbacks of Common Channels on Iur, Source: Siemens, Italtel

[2] TS 25.420, UTRAN Iur Interface. General Aspects and Principles