TSG-RAN Working Group 3, meeting #2 ***TSGW3#2(99)180***

Stockholm, Sweden, 15-19 March 1999

Agenda Item: 12

Source: Nokia

Title: **Signalling Systems in RAN**

Document for: Approval

---

1 Introduction

The suitability of different technologies as the Signalling Bearer for RANAP and RNSAP have been widely discussed both in ETSI SMG2 UTRAN Architecture EG and the successor of its work in 3GPP, the TSG RAN WG3. The debate has been generally between two technologies, SS7 and TCP/IP, and their suitability for the purpose. This contribution summarises the current situation for different interfaces and takes another viewpoint addressing the issue of different kinds of Signalling Systems needed for RAN.

The area where decision is completely missing is Signalling Bearer for RNSAP. The current documentation states that SS7/SAAL-NNI is used for Signalling Bearer for RANAP, but since the issue has been discussed recently, this contribution also addresses that area.

2 Current Situation in RAN WG3 Documentation

The general structure for the RAN interfaces is as presented in the Figure 1. This general presentation does not take any position on the technology used for those parts that do not state it explicitly (ATM has been agreed to be the common transport technology).

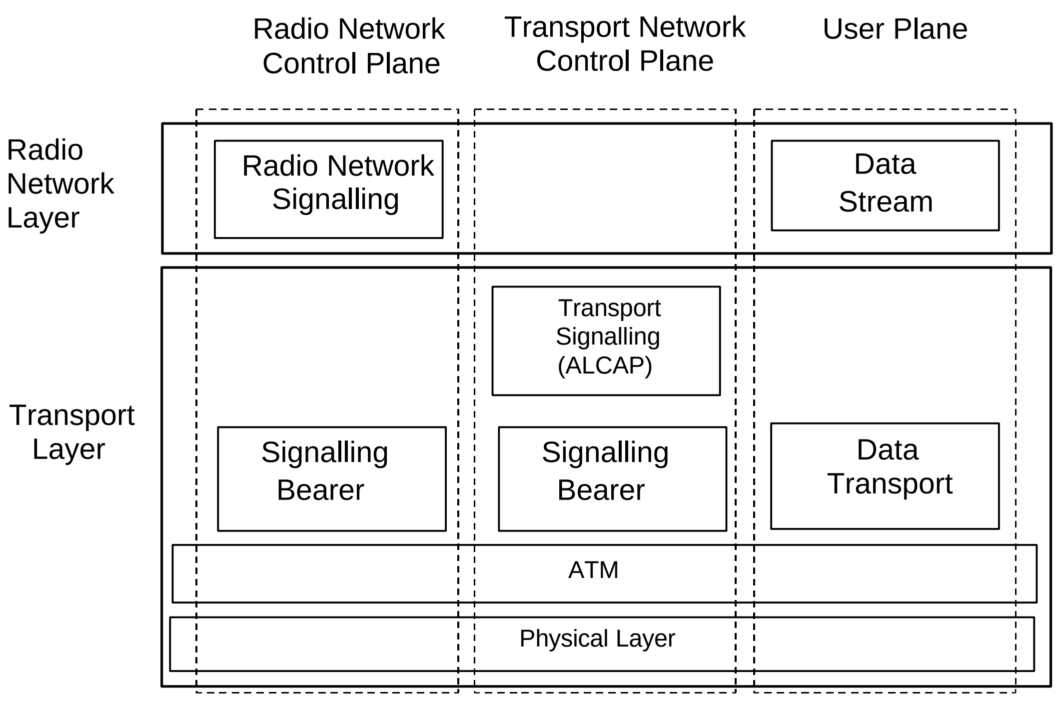

Figure 1: General Protocol Structure for UTRAN Interfaces

The following working assumptions and decisions exist in the WGR3 documentation:

Iub:

- Radio Network Control Plane:
  - Application Protocol: NBAP
  - Signalling Bearer: SAAL-UNI/ATM
- Transport Network Control Plane:
  - Transport Signalling: Q.AAL2
  - Signalling Bearer: Signalling Bearer Converter/SAAL-UNI/ATM
- User Plane:
  - Data Transport: AAL2/ATM

Iur:

- Radio Network Control Plane:
  - Application Protocol: RNSAP
  - Signalling Bearer: No final decision, but it is agreed that it is either SS7/SAAL-NNI or TCP/IP/AAL5
- Transport Network Control Plane:
  - Transport Signalling: Q.AAL2
  - Signalling Bearer: Signalling Bearer Converter/MTP-3b/SAAL-NNI/ATM
- User Plane:
  - Data Transport: AAL2

Iu:

- Radio Network Control Plane:
  - Application Protocol: RANAP
  - Signalling Bearer:
    - 3G-MSC domain: Documentation states SS7/SAAL-NNI, but the usage of TCP/IP/AAL5 has still been discussed. It is not clear if TCP/IP/AAL5 is strongly supported by anyone for 3G-MSC domain.
    - 3G-SGSN domain: Documentation states SS7/SAAL-NNI, but the usage of TCP/IP/AAL5 has still been discussed.
- Transport Network Control Plane:
  - Transport Signalling:
    - 3GMSC domain: Q.AAL2
    - 3GSGSN domain: No decision
  - Signalling Bearer:
    - 3GMSC domain: Signalling Bearer Converter/MTP-3b/SAAL-UNI/ATM
    - 3GSGSN domain: No decision
- User Plane:
  - Data Transport:
    - 3GMSC domain: Signalled AAL2
    - 3GSGSN domain: one or several AAL5 PVCs with multiple user flows multiplexed on each of them

3 Discussion

3.1 General

The current decisions and working assumptions in WGR3 documentation are illustrated in Figure 2 below. It should be noted that it is not clear if anyone is strongly against using SS7/SAAL-NNI for the 3G-MSC Domain.

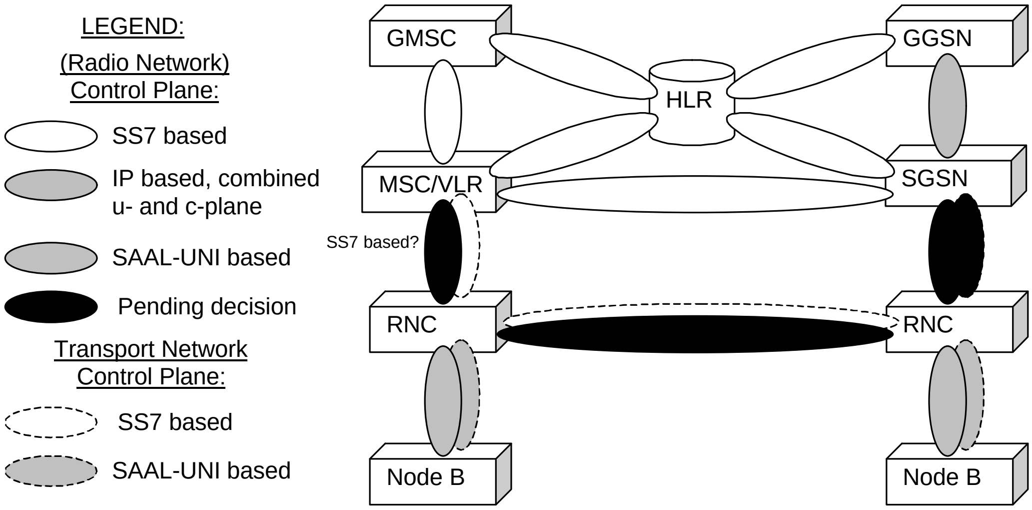

Figure 2: Current status of the types of signalling in different interfaces

The signalling in different interfaces that are of the same type (same level of shading) can be formed into Signalling Systems, like the SS7 for the various interfaces of GSM-UMTS backbone (partly shown in Figure 2). The advantage of this is that the resources for signalling in different interfaces can be managed and controlled with uniform means, and thus the complexity of having many ways of doing one thing is avoided. Furthermore, as a possible option for the future, the different interfaces of same type may be developed into a routable signalling network, or connected to an existing one (This is a secondary goal as it is enough at least for the first phase(s) that the interfaces are point-to-point).

3.2 Transport Network Control Plane

Signalling in the Transport Network Control Plane is closely related to the User Plane transport in the corresponding interface, and often uses the same transport means as the User Plane itself. Therefore the formation of Signalling Systems for the Transport Network Control Plane is not viewed to be as important as the same capability for Radio Network Control Plane. The Transport Network Control Plane is not further discussed in this document.

3.3 User Plane

Depending on the implementation, also Radio Network Control Plane and User Plane may be using the transmission resources. However, the possibility to consider signalling in the Radio Network Control Plane as part of a wider signalling system and as logically separated from the u-plane should be supported. It should be noted that the reliability and availability requirements of Control Plane (either one) are generally higher than those of the User Plane. In practical implementation this means that regardless of the technology, the Control Plane is always assigned dedicated transmission resources, that are separated from the User Plane. Therefore it is viewed that using the same technology as in the User Plane does not provide similar synergy as using the same technology for Radio Network Control Plane in different interfaces of same network entity. The User Plane is not further discussed in this document.

3.4 SS7 based Signalling Bearer for RNSAP and RANAP

Figure 3 illustrates the case where SS7 based technology is used in Iu and Iur.

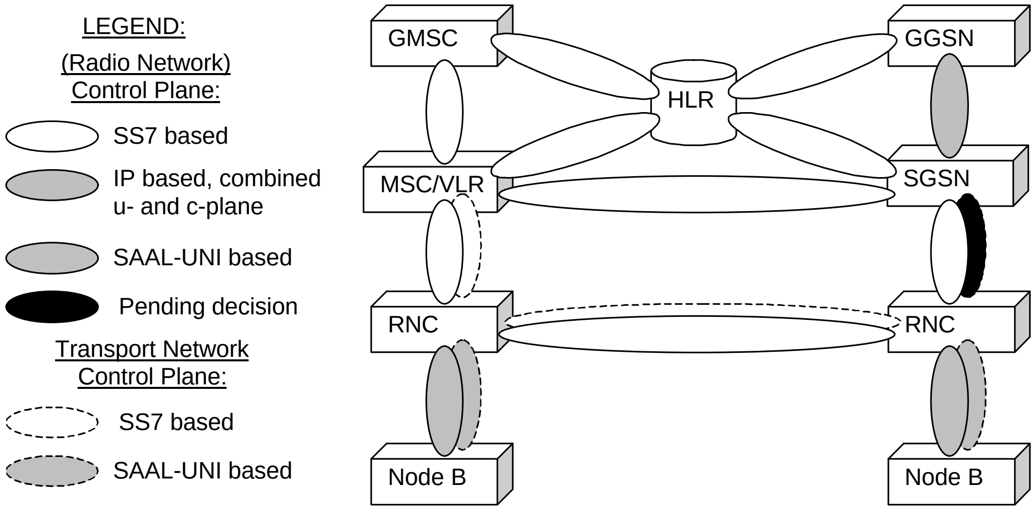

Figure 3: RAN Signalling Systems when SS7 based Signalling Bearer is used for RNSAP and RANAP

The figure well emphasises the fact that the usage of SS7 technology in Iu and Iur unifies the signalling in the UMTS system, by reducing the number of different systems.

3.5 TCP/IP based Signalling Bearer for RNSAP and RANAP

Figure 4 illustrates the case where TCP/IP based technology is used in Iu and Iur.

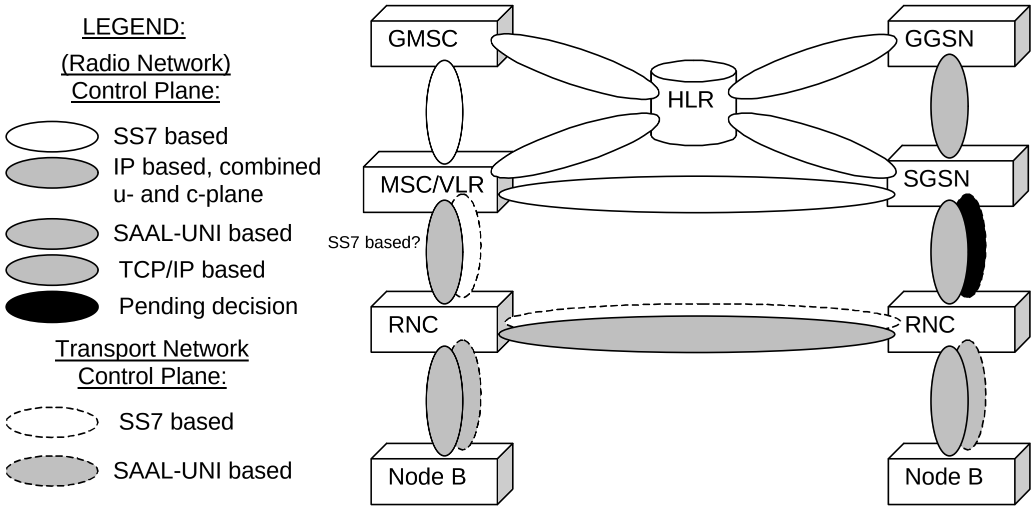

Figure 4: RAN Signalling Systems when TCP/IP based Signalling Bearer is used for RNSAP and RANAP

It can be seen from this figure, that if TCP/IP is used as the signalling bearer for either RNSAP, RANAP or both, a new type of signalling system is introduced to the RAN system. This signalling system is not similar to any of the existing ones. It is not the same as the Gn interface, because in the Gn interface the user and control planes are combined

4 Conclusions

It is viewed that the number of Signalling Systems should be kept low to allow the network to be easily configured, operated and maintained, in other words to keep the system as simple as possible. The usage of SS7/SAAL-NNI as the Signalling Bearer for both RNSAP and RANAP is the best solution in this sense, because the introduction of additional signalling system can be avoided.

It is believed that the usage of SS7/SAAL-NNI will ensure fast and timely development of the standards and introduction of products. The standardisation is alleviated because there is less need for developing completely new technology, i.e. solving the open questions related to the usage of TCP/IP as the signalling bearer, and efforts can be concentrated on the essential issues related to the new radio technology.

The usage of SS7/SAAL-NNI will speed up the implementation as there is no need to extensively test the new technology, and there is less need for additional resources for this task, since the implementation of SS7 protocols are in any case required from SGSN (MAP), and most likely also RNC (Iu to MSC Domain). It should also be pointed out that all major telecommunication manufacturers already have tested implementations of SS7 (for the purpose of telecommunications signalling) that can be reused for this purpose.

The saving in time and resources both in standardisation and implementation are likely to lead into savings in the cost of the product.

In general new technologies should be taken into use when it is clear that they will provide added value to the system, or when it is clear that future enhancements of the system are better supported by that new technology. It should be noted that Nokia is not against TCP/IP in general, but the advantage of using it for this purpose has not been demonstrated clearly, and it is not evident what future enhancements would require the usage of TCP/IP.

5 Proposals

It is proposed that SS7/SAAL-NNI is used as the Signalling Bearer for both RNSAP and RANAP. The modifications required to WGR3 documentation are described in the following two proposals:

<u>Proposal 1:</u>

The following figure and text should replace the current text in section 5.2 of S3.22, Iur Interface Signalling Transport [2]:

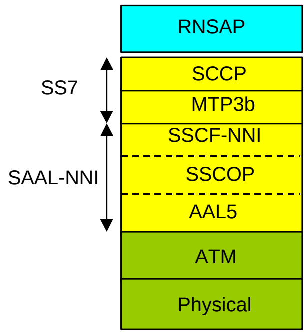

Figure XX. Protocol Stack for Radio Network Control Plane in Iur Interface

SCCP (Signaling Connection Control Part) provides: connectionless service class 0, connectionless service with guaranteed order class 1, connection oriented service class 2, separation of the connections mobile by mobile basis on the connection oriented link and establishment of a connection oriented link mobile by mobile basis.

MTP3b (Q.2210) (Message Transfer Part) provides message routing, discrimination and distribution (for point-to-point link only), signaling link management, load sharing and changeover/back between link within one linkset.

SSCF-NNI (Q.2140) (Service Specific Coordination Function) maps the requirements of the layer above to the requirements of SSCOP. Also SAAL connection management, link status and remote processor status mechanisms are provided.

SSCOP (Q.2110) (Service Specific Connection Oriented Protocol) provides mechanisms for the establishment and release of connections and the reliable exchange of signaling information between signaling entities.

AAL5 (ATM Adaptation Layer Type 5) adapts the upper layer protocol to the requirements of the Lower ATM cells.

ATM (Asynchronous Transfer Mode) as specified in ITU-T recommendation I.361.

<u>Proposal 2:</u>

The following statement should be removed from section 5.2 of S3.12 Iu Interface Signalling Transport [1]:

Other protocol stacks that may fulfil the requirements are FFS.

6 References

[1]: S3.12, Iu Interface Signalling Transport, v.0.0.2. source: Editor

[2]: S3.22, Iur Interface Signalling Transport, v.0.0.2. source: Editor