Technical Specification Group, Radio Access Network
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Title: **Analysis of the OHG proposal**

Document for: **Discussion**

Agenda Item:

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1 Introduction

This document presents an initial analysis of the requirements that the Operators Harmonisation Group (OHG) proposal [1] would place on the 3GPP release 99 contents. It addresses the work to be performed in 3GPP in 99 to cover these requirements which would allow for the provision for connection of UTRA radio interface to ANSI41 networks, while allowing seamless handovers with a cdma2000 (Multi Carrier including 1xRTT) radio interface.

2 References

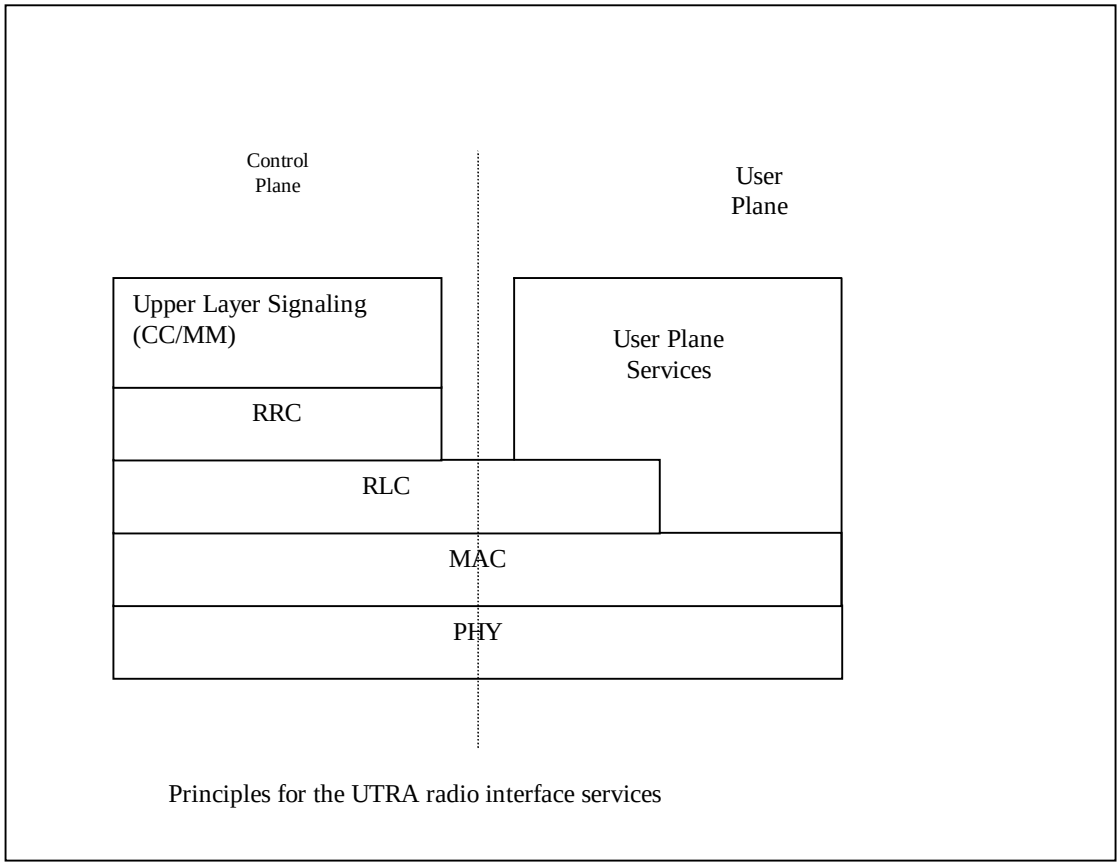
[1] RP-99358 Open Letter to Standard Organisations from OHG on Global 3G (G3G) CDMA standard.
[2] 3GPP TR 25.921 Guidelines and principles for protocol description and error Handling

3 Mapping of ANSI 41 onto UTRA radio interface

First we will address where the upper layers are expecting services from the UTRA stack, since it is where the mapping of ANSI41 onto UTRA will be performed:

- Upper layer signalling (MM, CC) is mapped on top of RRC, and uses its transport function for UE to network communication. This signalling is transparent to the UTRA stacks.
- The control of the services provided by the User plane of the UTRA stacks is provided via the generic SAPs on top of RRC. This is purely a model since these SAPs are local to the RNC and UE.
- The user plane services are mapped on top of the RLC layer (for Acknowledged Mode, Unacknowledged Mode, and Transparent Mode) or on top of MAC (when no RLC service is needed). Note that in model of RAN2, all services are on top of RLC, but RLC can be transparent..
- Concurrent user plane services can be flexibly multiplexed by MAC or Layer 1 multiplexing.

This leads to the following representation of the service mapping on the UTRA protocol stacks:



Principles for the UTRA radio interface services

This means that the following services will be used for cdma2000 services:

- The transport services provided by RRC to Upper layers
- The services provided directly on top of the MAC layer
- The services provided directly on top of the RLC layer

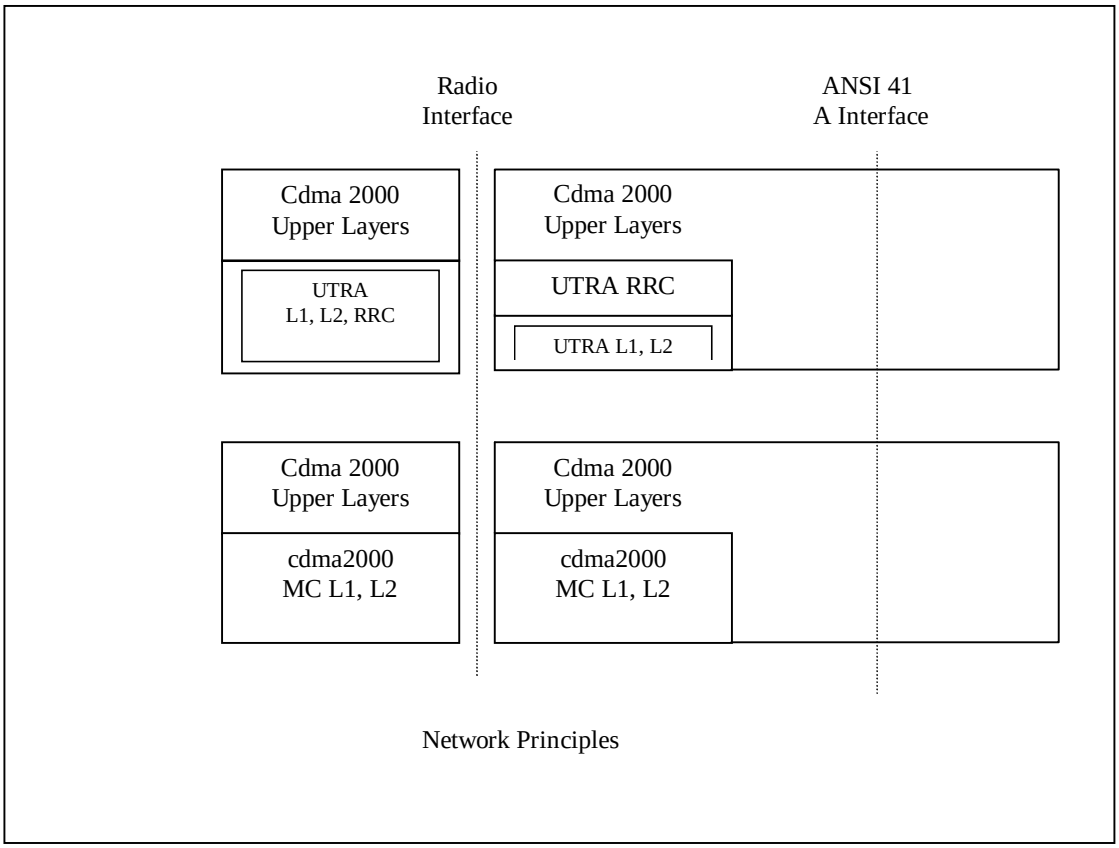
4 Handover aspects

Since the cdma2000 (MC including 1xRTT) to/from UMTS handover can be based on a hard handover procedure, protocol extensions of RRC should be sufficient. On the user plane level, a reset of the L1 and L2 will be necessary, similar to the case of inter-BSC handover in cdma2000. This means that Layer 2 protocols from cdma2000 and UMTS do not need to be aligned in how that provide the services, but only on which services they provide.

RRC protocol extensions will be necessary for the signalling of handover between cdma2000 and UTRA.

5 Architecture aspects

The following figure shows how UTRA radio protocol stacks are incorporated inside an ANSI41/cdma2000 architecture, according to the principles developed in [1].



The mapping of the cdma2000 on the radio interface is performed inside the Access Network (in fact, the node which is responsible for providing these UTRA radio interface services on the network side is the RNC). This is *within* the RAN, and therefore does not impact the Iu interface or other higher level entities in the network (like the Core Network).

On the UE side, the services used are only those of the Access Stratum (RRC and below), and are therefore also fully constrained in the RAN also.

6 Hooks and extensions

The OHG proposal [1] defines that hooks and extensions should be provided so that the services provided by the UTRA radio interface layers can later support the cdma2000 Upper Layer signalling and services.

Hooks and extension are only means by which a given protocol can be extended to supported new functions in future releases. The only true requirement in order to achieve backwards compatibility is to provide a good error handling mechanism is the UEs. This is already a pre-requisite in 3GPP alone, since this support is essential for a viable evolution of the system in future releases. Therefore, this is already a requirement of 3GPP release 99.

Nevertheless, in order to have a straightforward implementation of dual mode equipment, it is beneficial that these are straightforward extensions, rather then requiring some restructuring of the radio interface architecture. This will allow to later enhance the UTRA protocol stacks, rather than introducing specific changes. It is also important that these extensions are provided in a way which is backwards compatible, but as already stated extensibility is a basic property of the release 99 of 3GPP.

Based on the assumption that protocol extensions, like addition of new RRC messages, is a straightforward exercise for the UTRA protocols, work should focus on services provided to the Upper layers, both for the control plane but also the user plane. Still, what needs to be considered is not only whether ANSI41 can be supported by UTRA (for which the answer can be positive without much risks), but whether ANSI41 can be supported *efficiently*.

The following sections will look at the extensibility mechanisms which are in place in 3GPP today in order to understand what should be done in 3GPP for the release 99 in view of meeting the OHG recommendations.

6.1 Physical layer extensions

An analysis was performed within the work of the OHG on the services provided by the physical layer. This analysis did not identify services required by cdma2000 which would be missing from WCDMA L1.

The impacts on the physical layer should therefore be limited to the following two categories:

- Already identified harmonisation of physical layer, as proposed in [1]
- Later changes that would be the consequence of the need to support new transport channels to map *efficiently* some cdma2000 services.

The current list of Transport Channels supported in 3GPP is very wide, providing capabilities from low bit rate to high bit rates requirements, as well as an efficient support for bursty to continuous traffic profiles. Therefore it may be enough for the mapping of cdma2000 services.

Nevertheless, whenever necessary, new transport channels can easily be added in later releases of the standard and overlayed at the physical layer on already defined channels.

6.2 RRC, RLC and MAC layer extensions

All layers can be extended in a straightforward manner based on the preliminary principles already defined in [2]. In fact, RRC allows also to negotiate RLC and MAC protocol capabilities (or versions), so that extensions can always be added.

RRC messages can be easily added or existing messages can be extended. Also, RRC allows to transport efficiently Upper layer messages in an efficient way irrespective of their size. In fact, GSM/GPRS has a variety of DTAP signalling messages, from relatively small MM messages, up to SMS or even USSD which can be relatively big.

No restriction is expected on the extensibility of RRC, RLC and MAC after release 99. Also, extensibility is from the beginning a crucial requirement because further releases are envisioned (with some items already known are being in later release only).

6.3 Identification of global functional architecture

In order to ensure that the extensions which would be added on the existing protocol do not imply a restructuring of the protocol architecture, the global functional architecture should be defined in 99.

7 Conclusion

Based on the preliminary analysis explained in this contribution, it appears that extensions to the UTRA radio protocol stacks as requested in [1] can be performed in future releases in a similar manner to what has already been planned for 3GPP evolution.

Regarding the extension capabilities of UTRA protocols, it has been shown that this is already a baseline requirement for the 3GPP release 99, and therefore does not represent extra work based on the OHG proposal.

Since the radio interface has been tailored for multimedia support, it provide a great flexibility in the services that is provides. Also, its architecture has been modelled so as to allow for gradual extensions in a straight forward way (as proven recently in the way that the CPCH concept could be incorporated in a simple manner).

As a consequence, it is expected that the impacts on 3GPP release 99 can be limited to the following:

- Harmonisation of the physical layer parameters (pilot structure and chip rate), for which concrete proposals were already made in WG1 and WG4.

- Identification of the services provided by the UTRA MAC, RLC and RRC layers which would be missing and would need to be added later.

These impacts are not expected to influence the current time plan in 3GPP for release 99.

It has also been shown that the necessary work is limited to the UTRA radio interface specifications. There should be no implications on the bearers and services provided by UTRAN. Therefore no impact is expected on the work of TSG-SA and TSG-CN.