

Agenda Item:

Source: Nortel Networks

Title: Requirements for extension capabilities

Document for: Discussion

Introduction

In order to cope with the evolution of L2/L3 radio protocols after Release 99, we have to provision for extension capabilities. This issue is tightly related to error handling, e.g. what happens when a R99 MS receives a R00 message or parameter and vice versa. TR25.921 lists different levels of principles to ensure version compatibility. This paper studies the requirements from the TR and makes proposals for the application to the UTRAN protocols.

Protocol version

The definition of a version for a protocol is subject to discussion. Should the version be incremented each time a new element is added, or only when a major change is introduced ? It can rapidly become unmanageable to change the version of a protocol at each minor addition.

We can expect RLC and MAC, as layer 2 protocols, to be quite stable after the first Release. Major evolutions, like e.g. introduction of Hybrid ARQ for RLC, will probably require a new version. But the main characteristics of the protocol should not change much, especially with the RLC toolbox concept that allows a lot of flexibility. Therefore it is proposed that RLC and MAC are given a version number. This parameter has to be negotiated between the UE and the network. The UE has to indicate the version of the protocol that it supports, e.g. in the UE capability information. During RAB setup, the network must then signal the version to be applied to the RLC (/MAC) connection. The UE could then confirm this in the RAB Setup Complete.

An issue related to this is the extensibility of the RLC UM and AM headers (and MAC headers). Will the introduction of new fields in the header be considered as a new RLC version, or should there be a separate extension mechanism, by provisioning e.g. at least one spare bit to extend the header ?

On the other hand, with the RRC protocol, we can foresee that there will be many additions, related to specific features. Examples of this that we can already see today are : CPCH parameters, DPCH gated transmission, FAUSCH, possibly LCS, etc... that can be seen as not part of the minimum baseline functions of RRC, like radio bearer setup procedures, transport/physical channel configurations, but that need to be added each time a feature is being included in the specifications.

It will not be easy to manage a new version for each new feature that is introduced. Therefore it is proposed that RRC does not have a version number, and other extension mechanisms are provided.

Extension of RRC protocol

New message

The introduction of a new feature can sometimes require the creation of new messages. This is usually related to the support of a specific UE capability that is known by the network. In GSM for example, when the Advanced Speech Call Items (ASCI) were introduced, a whole set a new messages was created in the Radio resource protocol.

Even if receiving an "Unknown message type" is not supposed to cause a major breakdown in the UE, we should avoid having to send new message types to UEs that do not support them. This will generally be possible on

dedicated channels. In the case of broadcast information, we cannot avoid sending new System Information blocks or new information inside the System Information blocks to old mobiles, and we have to be careful to specify a mechanism to enable a UE to skip an unknown System information block, without causing any error.

Note that message type field should have a sufficient number of bits to allow for enough messages to be defined. However, this method of extension should not be used too extensively.

New parameter

In most cases, an evolution of the protocol will result in the addition of a new Information Element. The new IE can be added as an optional IE, after the mandatory IEs. On a dedicated channel, the sender may send the new element only if it knows that it is supported by the receiver. But in some cases, the sender might not have the knowledge of whether the IE is supported. Therefore a UE (and the network) must be able to discard any element that it does not understand.

New values of an existing parameter

Some parameter fields will need to be extended with new values, new field formats or additional items in a list. One example is the UE mode capability information, which is a list of the UE radio frequency, system,.. capabilities. In the future, there will be new types of capabilities to add.

Another example is the signalling of a list of frequencies, which can be in different formats : for harmonisation with cdma2000, handover between multicarrier (MC) and Direct-Sequence (DS) modes will require the signalling to support both the DS carrier raster (200Khz) and the MC carrier spacing (50 Khz).

Encoding rules

The mechanisms needed for the above extensions can be provided by the encoding rules in the message transfer syntax method : PER Packed Encoding Rules or ASN.1 provide support for extensibility.

Proposal

It is proposed to have a protocol version number for RLC and MAC, and to determine whether the mechanisms needed for RRC extension can be fully provided by the choice of the message transfer syntax, or whether other mechanisms are needed.