To: 3GPP SA WG2, SA WG4, CN WG3

CC: 3GPP RAN WG2

Source: 3GPP RAN WG3

Title: Liaison statement to SA2, SA4, N3 on the Iu User Plane (UP) specification status in RAN WG3

TSG RAN WG3 is currently developping the specification of the Iu User plane (25.415 V1.0.0) and would like to inform the interested 3GPP groups about our assumptions and status and ask some questions related to our work.

A brief presentation of the Iu UP protocol is attached.

To CN WG3

At our last meeting, RAN3 received the liaison from CN WG3 on CS data requirements. It is our understanding that N3 recently started work on CS Data for UMTS and identified the following user rates requirements:

- transparent services with user rates 28.8kbit/s (video telephony) and 64kbit/s (ISDN), other rates are FFS
- non-transparent services with user rates up to and including 64kbit/s

Those requirements could translate into little or no modifications of our specification if the features currently offered by the transparent and support mode for predefined SDU sizes mode could be utilized to offer the required CS data services. In the opposite case, it could translate into significant work and according to our current workplan, the Iu UP 25.415 specification should be finalized by our next meeting (20-25 September 1999).

It is therefore urgent that CN3 indicates precisely the features required over the Iu UP that are not currently in 25.415 V1.0.0

To SA WG4

At our meeting in Helsinki July 5-9, RAN3 received a liaison from SA4 on Support of Speech Service in RAN (R3-99767).

RAN3 has developped the concept of RAB sub flows, RAB subflow combination and co-ordinated DCHs to address the requirements of classes of bits (unequally error protected) within the RAB SDU. Currently over Iu, only the support mode for predefined SDU sizes support the concept of RAB subflows.

RAN WG3 assumes that the current 25.415 contains the basis of Iu UP services required for support of RABs needed for speech services as described in SA4 liaison.

RAN WG3 would appreciate prompt feed back from SA4 on our work.

To SA WG2

At our last meeting, RAN3 considered a proposal of a mapping of services onto Iu UP mode. While considering this contribution (R3-99980, in attachment 2), it appeared that it falls under SA WG2 QoS ad-hoc responsibility to define if and how such a mapping shall be documented in appropriate 3GPP specifications.

RAN WG3 is therefore seeking guidance from the QoS ad-hoc on this particular issue.

ATTACHMENT 1

Presentation of the Iu User Plane status

Major objectives

The Iu UP is designed with the objectives to remain independent of the CN domain (Circuit Switched or Packet Switched) and to have limited or no dependency with the Transport Network Layer. Meeting this objective provides the flexibility to evolve services regardless of the CN domain and to migrate services accross CN domains.

The Iu UP protocol is also designed bi-directionally in order to facilitate TFO mechanisms introduction, when required.

Modes of operation of the Iu UP

The Iu UP protocol is therefore defined with modes of operation that can be activated on a Radio Access Bearer basis rather than on a CN domain basis or (tele)service basis. The Iu UP mode of operation determines if and which set of features shall be provided to meet e.g. the RAB QoS requirements. The mode selection is fixed by the CN for the duration of the RAB and indicated to UTRAN in the Iu Control plane at RAB establishment (assignment or relocation).

Three modes of operation of the protocol are defined:

1. Transparent mode (TrM)
2. Support mode for predefined SDU size (SMpSDU)
3. Support mode for variabe SDU size (SMvSDU)

Transparent Mode

The transparent mode is intended for those RABs that do not require any particular feature from the Iu UP protocol other than transfer of user data. In this mode, the Iu UP protocol instance does not perform any Iu UP protocol information exchange with its peer over the Iu interface: no Iu frame is sent. The Iu UP protocol layer is crossed through by PDUs being exchnaged between upper layers and transport network layer.

For instance, the transfer of GTP-U PDUs in the PS domain is the transparent mode of the Iu UP protocol.

Support Modes

The support modes are intended for those RABs that do require particular features from the Iu UP protocol in addition to transfer of user data. When operating in a support mode, the peer Iu UP protocol instances exchange Iu UP frames whereas in transparent mode, no Iu UP frames are generated.

Some RABs requesting Iu UP protocol support, utilize the Iu UP protocol and possibly the radio interface protocols in specific ways (e.g. usage of RLC transparent mode). For instance, certain RABs can have variable predefined rates while other RABs can have totally variable rates within a range.

The Iu UP support and the usage of the radio interface protocols for these kinds of RABs differ significantly. Consequently, the Iu UP support mode has two variations:

1. Support mode for predefined SDU sizes (SMpSDU)

2. Support mode for variable SDU sizes (SMvSDU)

For instance, the transfer of AMR speech PDUs would utilise the support mode for predefined SDU size of the Iu UP protocol because it requires support from the Iu UP while the sizes of the user data being transferred can vary in a predefined manner.

Iu UP PDU Types

The Iu UP protocol PDU Types are defined for a given Iu UP mode of operation. An Iu UP PDU Type represents a defined structure of an Iu UP protocol frame. For instance, a frame with the following structure:

1. a Frame Control part (i.e. frame number, PDU Type, frame classification (TBD), RFCI)
2. a Frame Procedure Control part (e.g. passing Rate Control command)
3. a Frame Checksum part
4. a Frame Payload part

is specified as a certain PDU type valid for a given Iu UP mode of operation.

This approach provides the flexibility to defined PDU Types with different masks (e.g. without Frame Checksum)

Services of the support mode for predefined SDU sizes

Currently in our specification, the services provided by the Iu UP is support mode for predefined SDU sizes are the following:

- Transfer of user data
- Initialisation
- Rate Control
- Time Alignment
- Handling of abnormal event

Initilialisation service consists in passing in the Iu UP from UTRAN to CN, configuration data: RFCI(s) and associated SDU sizes.

Transfer of user data utilises RFCI (see RFCI section below) to identify the predefined SDU size in the Iu UP frame and is sent in every frame.

Rate Control (principle agreed and planned contribution for our next meeting) is intended to pass uplink command from the Rate Control function in the RNC up to the CN Encoding device to select DL rate. The DL rate encoded frames are passed as payload of the Iu UP frames (Uplink rate control is defined by RAN WG2). This is the equivalent functionality to Codec Mode Command/Request of GSM AMR, but is designed in a generic manner (by requesting RFCI). Indeed AMR Codec is seen as the first of many future applications that will be able to adapt their source-coding rate to the dynamically varying radio link capacity. The solution is therefore general and not only valid for AMR.

Handling of abnormal event (planned contribution for our next meeting) is intended to cover the fault situations such as detection of frame loss etc…

Frame classification (good or bad frame indication resulting from the radio interface indications) and possibly time alignment services are under developpment.

As of today, there are no identified services requiring the support mode of the Iu UP for totally variable SDU sizes, and therefore the efforts have been essentially concentrated on developping the support mode for predefined SDU sizes.

Support of Unequal Error Protection

RAN WG3 has considered the requirements for support of unequally protected bits for encoded speech frames. Considering that flows of bits of a RAB for speech service may have different BER, RAN3 introduced the concpt of RAB sub-flow as follows:

RAB sub-flows: A RAB is realised by UTRAN through one to several sub-flows. These sub-flows correspond to the NAS service data streams that have QoS characteristics that differ in a predefined manner within a RAB e.g. different reliability classes.

RAB sub-Flow Combination (RFC): A RAB sub-flow combination is defined as an authorised combination of the RAB sub-flows variable attributes (e.g. SDU sizes) of currently valid RAB sub-flows that can be submitted simultaneously to the Iu UP for transmission over Iu interface. Each combination is given by the CN and cannot be altered by the SRNC.

RAB sub-Flow Combination Indicator (RFCI): This indicator uniquely identifies a RAB sub-flow combination for the duration of the Iu UP peer protocol instances i.e. it is valid until the termination of the call or until a new initialisation is performed. Usage of RFCI applies only to Iu UP protocol operated in support mode for predefined SDU size.

For instance: 12.2 kbits/s AMR codec is represented as RAB sub flow 1 SDU size: 81 bits –class A bits-, RAB sub flow 2 SDU size: 108 –class B bits, as RAB sub flow 3 SDU size: 60 –class C-, which makes one RAB sub Flow Combination, identified by an RFCI allocated by the RNC. This is done for all rates (i.e. all codec modes, DTX also if included).

From an Iu UP protocol point of view, the SDUs coming from the upper layers (i.e. Codec) are seen as one single SDU. The RFCI received from the upper layers with the SDU represents the internal structure of the SDU, which is placed in the Iu UP payload part. The internal structure of the SDU needs to be known by the RNC function in charge of splitting the frame onto the co-ordinated DCHs. In the uplink direction, this same function in the RNC combines the co-ordinated DCHs SDUs in one Iu UP frame payload and set the RFCI accordingly.

ATTACHMENT 2

TSG-RAN Working Group 3 ***R3#6(99)980***
Meeting #6
Sophia-Antipolis, France 23 – 27 August 1999

Agenda Item: 9.1
Source: NTT DoCoMo
Title: Correspondence of mode in Iu UP protocol layer to services
Document for: Discussion

Introduction
This document describes Correspondence of the *mode* in Iu UP protocol layer to service.

Discussion
Reference [1] specifies two modes: *support mode* and *transparent mode*. Each mode has its own applied region. Support mode should be applied to the services that are not capable of performing the following functions in upper layer:

- Timing assurance (i.e. receiver can retrieve the correct interval of frames despite jitter)
- Error detection

On the other hand, if other layer already provides these functions, transparent mode should be applied to the service in Iu UP protocol. Derived from the above rule, support mode should be applied to speech service and transparent mode should be applied to PS service. This has already implicitly been regarded as an assumption.

In addition to speech and PS services, applied mode for other services such as UDI CS data, Multi Media Telephony and Circuit switched type of data should be specified. The following table proposes the applied mode for each service.

	UDI CS data	Multi Media Telephony	Circuit switched type of data such as modem and fax
Timing assurance for payload	Needed, but no function	Needed, but no function	Not needed
Error detection for payload	Not needed	Not needed	Needed, and RLP has this function
Applied mode	Support mode	Support mode	Transparent mode

Proposal
It is proposed that the following table should be added in an annex of reference [1].

Examples of service	Applied mode
Speech UDI CS data Multi Media Telephony	Support mode
Packet Circuit switched type of data such as modem and fax	Transparent mode

References
[1] UMTS 25.415, Ver.0.2.1