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**Agenda Item:**

**Source:** NTT DoCoMo

**Title:** Multiplexing function at L3CE layer

**Document for:** Decision

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## **1 INTRODUCTION**

This contribution proposes multiplexing functionality which is necessary for the UE to be miniaturised in the mobile multimedia world. First, it introduces some service examples that are expected in the very beginning of the 21<sup>st</sup> century so that 3G services could be beneficial and convenient for the mobile community. Then, it points out that the current assumed functionality is not enough for the UE to be miniaturised. Last, it proposes that multiplexing functionality, which exists in the SNDCP of the GPRS system, is necessary at the L3CE layer so that the 3G UE can be miniaturised.

## **2 SERVICE EXAMPLES**

(1) Example 1: UE with micro WWW browser & UE connected to a PC

Fig. 3 in Annex1 shows one service example which provides simultaneous multiple packet services. When UE is connected to a PC, users can access to corporate LAN through using best-effort QoS class while getting various information from different servers such as weather information, stock market information, recent news information, etc. through using best-effort QoS class. Alternatively, UE with micro WWW browsers enable users to get such information without setting up their PCs. In any cases, the UE can be carried and used for normal speech calls. It means that UE shall be miniaturised as much as possible for the 3G UE to be attractive for users.

(Note) NTT DoCoMo has launched new services called “i-mode” by using UE (almost the same size as the traditional UE) with micro WWW browser. This service can provide users with e.g. banking services, financial services, transportation schedule information, various ticketing services, weather information, e-mail services, town information by using packet networks, and the charging is based on volume-based charging. Of course the UE can be used for normal speech calls. Recently, the number of users has increased by 10,000 per day, and already reached 1,000,000 users since the service started in Feb. 1999.

Since currently only single call can be handled simultaneously, users have to switch the services if necessary. The “i-mode” services can be enhanced if simultaneous multiple packet calls are supported.

#### (2) Example 2: Car navigation with UE

If the penetration rate of the mobile users reaches to a certain level, the increase of users can be saturated. In order for mobile operators to improve their financial performance, new markets shall be developed. One of such markets is car navigation arena. Fig. 4 in Annex1 shows an example providing car multimedia services through using car navigation. In this example, Television service (streaming class), WWW browser service (background class), Point Cast-like information broadcasting service (background class), and car navigation service with traffic information and the latest map provision (background) are provided simultaneously. Therefore, one streaming class service and three background class services exist simultaneously. On the other hand, if users do not use the cars, they normally detach the UE from the car navigation systems and use the UE to make speech calls as a normal handy terminal. It means that UE shall be miniaturised as much as possible for the 3G UE to be attractive for users.

#### (3) Requirements

From the above example, the following requirements shall be considered.

(R1) Multiple calls connecting to different service servers with best effort QoS class can be handled simultaneously.

(R-2) UE shall be miniaturised as much as possible.

### 3 DISCUSSION

Since multiplexing function is not assumed at the L3CE layer in the current 23.121, in order to satisfy the above mentioned (R-1) requirement, all PDP contexts with best effort class shall be multiplexed at the MAC layer. In other words, each PDP context needs one RLC link respectively<sup>1</sup>. Therefore, in order for a UE to be able to accommodate the multiple PDP contexts, UE shall be designed to accommodate the same number of RLC links. However, since individual hardware memory is necessary to each RLC link, a UE needs to be equipped with more hardware resources. This means that (R-2) requirement cannot be satisfied. In order for a UE to be miniaturised as much as possible, the maximum number of RLC links implemented in a UE shall be minimised.

In case that QoS class of PDP contexts is “conversational” or “streaming”, each PDP context shall be mapped to one RLC link. (Fig. 1 (A)) However, in case that the QoS class is “background” or “interactive”, multiple

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<sup>1</sup> If the destination IP address of each PDP context is same, and QoS class of each PDP context is same, multiple PDP contexts can be multiplexed on top of L3CE. However, in normal cases, since the destination IP addresses are different as shown in the example, this method can not be applied.

PDP contexts with the same QoS class can be multiplexed to one RLC link, if L3CE layer can provide multiplexing functionality. (Fig. 1 (B))

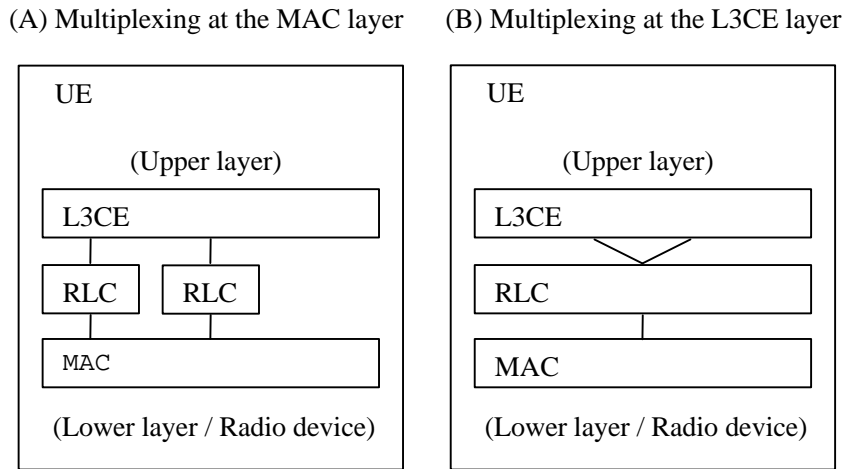


Fig. 1. Multiplexing at the MAC layer and the L3CE layer.

As mentioned in the section2, most of the simultaneous multiple PDP contexts will be best effort class. Therefore, if multiple PDP context with the same best effort QoS class can be multiplexed to one RLC link, the maximum number of RLC links which need to be implemented to a UE can be reduced. For instance, in case of the example 2 mentioned in section 2, only 2 RLC links are necessary if multiple PDP contexts with the same best effort QoS class are mapped to one RLC link, while 4 RLC links are necessary if each PDP context shall be mapped to one RLC link. Apparently, the size of a UE with 2 RLC links can be smaller than that of a UE with 4 RLC links.

Therefore, multiplexing functionality at the L3CE layer is beneficial so that UE can be miniaturised. Fig.2 shows the example of combination in case the multiplexing functionality is introduced at the L3CE layer.

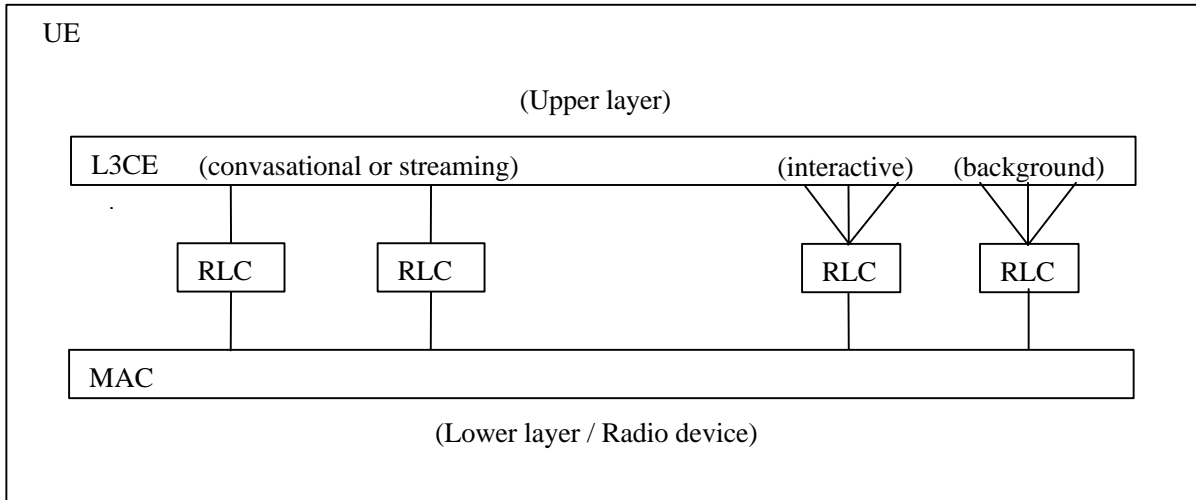


Fig. 2. A combination of both multiplexing methods in UE.

## 4 PROPOSAL

This contribution proposes that the standard shall support the multiplexing functionality at the L3CE layer. The CR to 23.121 is attached.

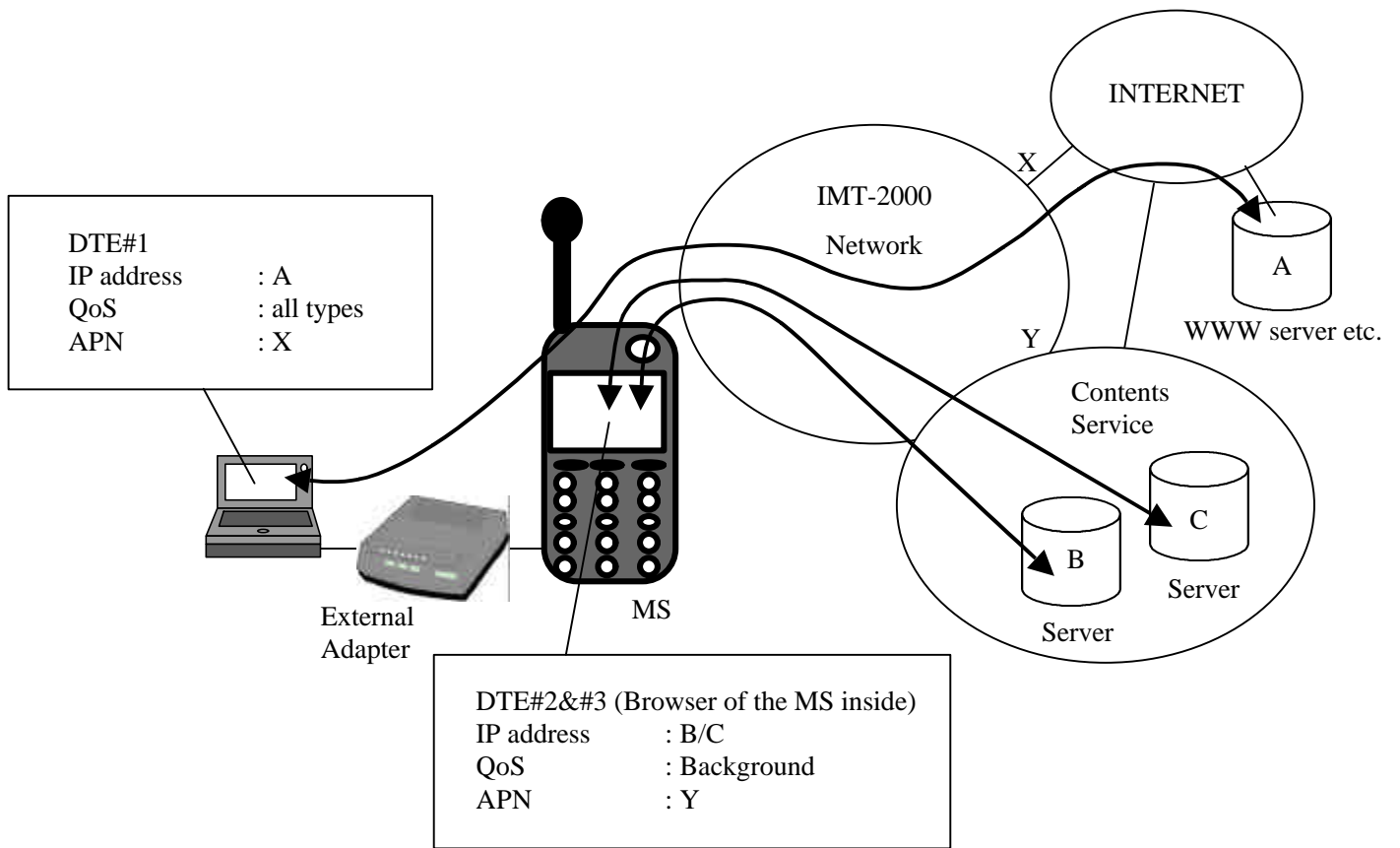


Fig. 3. Example of service image for L3CE multiplexing

Fig. 4

# Sample of using Multicall for Car Multimedia in Japan

The image shows a car multimedia interface with several components:

- Menu:** A horizontal bar at the top with buttons for Up Date, 交通情報 (Traffic Information), 天気 (Weather), Mail, WWW, 株価 (Stock Prices), 速報 (News), ホームセキュリティ (Home Security), メニュー1 (Menu 1), and メニュー2 (Menu 2).
- Television:** A window on the right displaying a news program with a person and balloons. It lists four channels:
  - ch. 1 ニュース&天気 (News & Weather): ニュース速報 (News速報), 今日の天気 (Today's Weather), 週間天気予報 (Weekly Weather Forecast)
  - ch. 2 マネー (Money): オムロン:IBMIに銀行用 (Omron:IBMI for Bank Use), ドンキホテがストップ高 (Don Quijote at Record High), 投資信託ランキング情 (Investment Trust Ranking Info)
  - ch. 3 コンピュータ&通信 (Computer & Communication): 米国郵政公社、Stamps.com (US Postal Service, Stamps.com), ロジテック、G3カラーの (Logitech, G3 Color), 2000年夏、メガビット級 (Summer 2000, Megabit Class)
  - ch. 4 スポーツ (Sports): 長嶋監督猛抗議も巨 (Nagashima's Fierce Protest Despite Giant), 大学生根本がVゴール! (College Student Honma's V-Goal!)
- WWW Browser:** A window on the right displaying a website with a person and balloons.
- Car Navigation (Map):** A map showing a route through a city with various landmarks and street names.
- Information (like "Point Cast"):** A green bar at the bottom displaying stock prices for companies like 東芝 (Toshiba), 富士通 (Fujitsu), 新日本製鐵 (Nippon Steel), and 三菱電機 (Mitsubishi Electric).