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# Performance analysis of a fixed local anchor scheme for supporting UPT services

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**Abstract**

Intelligent Networks (INs) are well suited for implementing Universal Personal Telecommunication (UPT) services. For efficient planning of IN accommodating UPT services, it is essential to analyze the effect of UPT user personal mobility. In this paper, an IN architecture with a fixed local anchor (FLA) is proposed for supporting UPT services. The performance of the proposed IN architecture is compared with an IN architecture based on IS-41 with consideration of UPT user personal mobility in terms of call delivery cost and location update cost. The performance of the proposed IN depends on the characteristics of UPT user mobility and incall deregistration. The proposed IN yields better performance than an IN based on IS-41 as UPT user mobility decreases and the probability of explicit incall deregistration increases. 

*Keywords*: Fixed local anchor scheme; UPT service

## 1. Introduction

A Universal Personal Telecommunication (UPT) service will enable users to originate and receive calls at any terminal through use of personal identification numbers. This type of system is destined to become popular in the near future [1]. ITU-T has recommended network capabilities to support UPT services [2], service procedure for UPT [3], and service descriptions and operational provisions for UPT service sets 1 [4]. UPT networks must track the location of UPT users in order to support PM. PM refers to the capability of end users to originate and receive calls and to access subscribed telecommunication services on any terminal in any location, and the capability of the network to identify end users as they move. PM can be supported through a unique personal number, i.e. the UPT number, in wireline and wireless networks.

UPT networks have been studied in several research areas such as UPT functional architecture [5–9], information localization scheme [10–11], service control scheme [12–14] and performance evaluation [15–17]. Lauer [13] proposed local, remote, and home methods to control UPT services in wired networks and also compared these methods in terms of new service deployment, service provider requirements, and network performance. Folkestad [14] presented three models for distributing UPT service SSP and SCP in signaling networks and evaluated their performance by calculating the mean call setup time. Kwiatkowski [15] calculated the network load required to access SCPs or databases without considering UPT user mobility. Chung and Sung [16] proposed a request-based scheme for incall registration/deregistration of UPT users and incall registration resets of terminal owners, and evaluated the performance of the scheme in terms of total cost and the number of terminal profile accesses per unit time for a terminal. Chung et al. [17] also proposed an alternative scheme, i.e. a timer-based scheme for managing information related to incall registration and compared the performance of the timer-based scheme with the request-based scheme in terms of the number of signaling messages transferred between SSP and SCP per incall request reset for a terminal.

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*Abbreviations*: CCF, call control function; CRR, call to registration ratio; FLA, fixed local anchor; IN, intelligent network; LSTP, local signal transfer point; PM, personal mobility; RA, registration area; RMR, registration to mobility ratio; RSTP, regional signal transfer point; SCF, service control function; SCP(H/V), service control point (home/visited); SDF, service data function; SRF, specialized resource function; SSF, service switching function; SSP, service switching point; UPT, universal personal telecommunication

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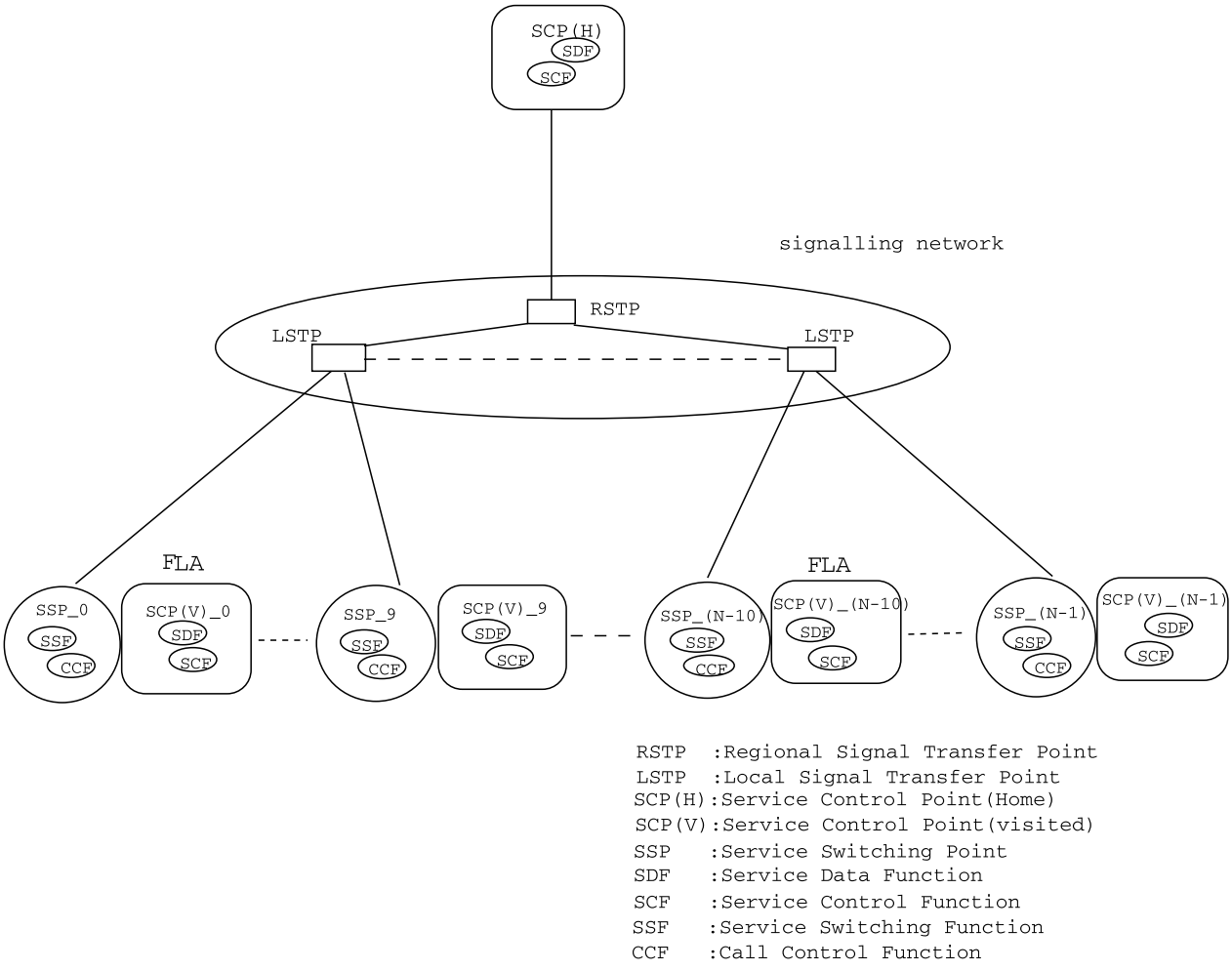


Fig. 1. An IN architecture with FLA.

In an UPT environment, user location information is generally updated by UPT users requests, and then, the request messages are required. The characteristics of UPT user incall registration and deregistration should be considered in the design of INs for supporting UPT services. Signaling message transfers between SSPs and SCPs are required for tracking the UPT user location whenever a UPT user registers/deregisters an incall. This may cause a higher traffic load in signaling networks if the current location of a UPT user is far away from the associated SCP, and if the UPT user registers/deregisters incall frequently. The SCP involved in processing location registration/deregistration and call delivery may experience excessively high database access traffic.

An IN architecture using a FLA scheme is proposed in order to support UPT services. The FLA scheme is modified from the LA scheme proposed by Ho and Akyildiz [18]. The performance of the proposed IN architecture is evaluated in terms of the call delivery cost and the location update cost. The rest of this paper is organized as follows: Section 2 briefly explains some UPT service features; Section 3 proposes an IN architecture with FLA and explains incall registration/deregistration scenarios; Section 4 derives both the call delivery cost and the location update cost; Section 5 compares the performance of the proposed IN architecture with the IS-41-based [19] IN architecture and Section 6 presents conclusions.

## 2. Features of UPT Service

The essential features, including the following, have been defined for the operations of UPT service set 1 [4]:

- UPT user identity authentication is required to verify the identity of each UPT user.
- Incall registration enables UPT users to register for incoming calls on the current terminal.
- Outgoing UPT calls allow UPT users to initiate an outgoing UPT call attempt from any terminal.
- Incall delivery provides voice connection to UPT users who registered incalls using the registered terminal address of the UPT user regardless of the location and type of the terminal.