T1P1

Wireless/Mobile
Services and Systems

A Technical Subcommittee of
Standards Committee T1
Telecommunications

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Industry Solutions

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Chairpersons – 3GPP TSG SA, RAN, CN and T
Chairpersons – GSM Association, GSM Alliance and UMTS Forum

Subject: Inter-network soft handover

Dear Sir or Madame:

T1P1 reviewed contribution (Attached), which discussed the issue of cross border co-ordination and inter-network soft handover. The contribution highlighted the challenge of interference coordination across license boundaries when deploying CDMA Direct Spread or TDD (called W-CDMA). The contribution noted that a detailed investigation was done within ERC TG1[*], in which three cross border co-ordination methods have been studied:

- frequency co-ordination,
- field strength co-ordination,
- scrambling code co-ordination.

The conclusion of this investigation was: *None* of these cross border co-ordination methods as such completely addressed the problem, and presumably the best method to tackle the issue is:

- to assign minimum *three* W-CDMA frequencies to an operator and
- to apply all three cross border co-ordination methods together.

The contribution then proposes a fourth and truly system inherent method of cross border co-ordination: inter-network soft handover. This “natural” way to overcome the cross border co-ordination problem would require establishing a 1-1 relationship between two networks. Assumed that in many (if not most) cases network internal Iur interfaces will not run over direct RNC↔RNC links but over “logical” RNC↔RNC links via the connecting switch(es), no major problem for the specification of inter-network soft handover is seen.

T1P1 supports this concept of using inter-network soft handover as one tool to mitigate cross-border coordination issues and recommends that 3GPP address the technical aspects of this issue for Release 2000.

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[*] T-Mobil and Deutsche Telekom, *UMTS cross-border co-ordination,* ERC TG1 meeting #12, Sept. 1-3, 1999, Tdoc TG1(99)140

Nevertheless, this kind of approach raises some issues that may not be technical but rather "business relationship" in nature:

- Is there a need for an authentication of the roamer by the new network?
- How will the splitting of charges between network operators becomes be dealt with?
- Should the preferred PLMN mechanism be overridden by this inter-network soft handover?
- Can the assignment of W-CDMA carriers by national regulatory authorities be made flexible enough to allow for an optimal inter-network soft handover choice?

T1P1 urges such organizations as the GSM Association, the GSM Alliance and the UMTS Forum to begin to study these business issues associated with inter-network soft handover.

Best regards,

[Original copy signed by Asok Chatterjee]

Asok Chatterjee
Chairman, T1P1

cc: Mike Williams, Chairman – TR46.2

Technical Specification Group Services and System Aspects
Meeting #5, Kyongju, Korea, 11-13 October 1999

TSGS#5(99)427

Source: **T-Mobil, max.mobil.**

Title: **Cross border co-ordination and inter-network soft handover**

Document for: **Approval**

Agenda Item: **6.7 (Release '00 and beyond)**

1. Introduction

The issue of cross border co-ordination for W-CDMA based systems has been addressed by several bodies and fora. Recently, a detailed investigation was done within ERC TG1[*]. Three cross border co-ordination methods have been studied:

- frequency co-ordination,
- field strength co-ordination,
- scrambling code co-ordination.

The conclusion of this investigation is: *None* of these cross border co-ordination methods as such is really satisfying (see below), and presumably the best method to tackle the issue is

- to assign minimum *three* W-CDMA frequencies to an operator and
- to apply all three cross border co-ordination methods together.

This paper proposes a fourth and truly system inherent method of cross border co-ordination: *soft handover*.

Besides the obligatory *network internal handover*, the current handover specification deals with 2G/3G intra-network inter-system handover only. This proposal would add the inter-network soft handover case.

2. Cross border co-ordination methods

Frequency co-ordination by definition leads to massive capacity losses: in case two W-CDMA based networks are to be co-ordinated both operators would have to accept a capacity reduction by 50%, and in case three W-CDMA based networks are to be co-ordinated only one third of the capacity would be left over per operator. Anyway, if applied in continental Europe the frequency co-ordination would result in poor capacities along the boundaries.

Note that this also holds for regional W-CDMA systems within *one* country.

Field strength co-ordination can be considered as some sort of variant of the previous case. Of course, co-channel interference between neighbouring networks can be kept small by simply not covering the border area itself from both sides. There have been proposals to employ a mutual overlapping of frequencies, however, this is de facto a frequency co-ordination resulting in poor capacity for the border area.

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[*] T-Mobil and Deutsche Telekom, *UMTS cross-border co-ordination,* ERC TG1 meeting #12, Sept. 1-3, 1999, Tdoc TG1(99)140

Scrambling code co-ordination for the uplink doesn't resolve the well-known near/far problem: a UE being relatively far from its serving NodeB but already very close to a NodeB of the neighbour network will both suffer from this NodeB and disturb this NodeB. Within *one* network, this issue is resolved via soft handover.

Therefore, some sort of "natural" way to overcome the cross border co-ordination problem seems to be **inter-network soft handover** establishing a 1-1 relationship between two networks. Assumed that in many (if not most) cases network internal Iur interfaces will not run over direct RNC↔RNC links but over "logical" RNC↔RNC links via the connecting switch(es) no major problem for the specification of inter-network soft handover is seen.

Nevertheless, this kind of approach raises some questions:

- is there a need for an **authentication of the roamer by the new network**? Of course it is up to the serving network to decide which events are subject to authentication. But is the authentication for the ongoing call/session already performed by the old network good enough for the new network or should there be an additional authentication?
- obviously, the **splitting of charges between network operators** becomes more difficult. This is especially true in case customers are living in the border area and thus would tend to become frequent or even permanent roamers.
- the **preferred PLMN mechanism** frequently applied in the roaming case would be overridden by such inter-network soft handover.
- can the **assignment of W-CDMA carriers** by national regulatory authorities be made flexible enough to allow for an optimal inter-network soft handover choice?

3. Proposal

It is proposed to include inter-network soft handover into R'00. The feature shall be optional.