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TSG RAN Meeting #6

T1P1 Vireless/Mobile

Services and Systems

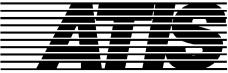
A Technical Subcommittee of Standards Committee T1 Telecommunications

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Alliance for Telecommunications 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 \leftrightarrow RNC links but over "logical" RNC \leftrightarrow 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.

^{*} 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 coordination: *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.

^{*} 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 lur interfaces will not run over direct RNC \leftrightarrow RNC links but over "logical" RNC \leftrightarrow 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.