TSG-SA Working Group 1 (Services) meeting #3 ***TSGS1#3(99)265***
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3GPP TSG-CN WG2 **Tdoc 3GPP N2-99 277**
ETSI STC SMG3 Working Party 'C'
Issy les Moulineaux, FRANCE
22nd -26th March 1999

Title: **Liaison Statement on the Pre-paging Feasibility Report**

To: **TSG SA WG2**

Copied to: **TSG SA WG1, TSG CN WG1**

From: **NEC Technologies (UK), Fujitsu Telecom Europe (UK)**

TSG CN WG2 would like to inform TSG SA WG2 that TSG CN WG2 is currently studying Pre-paging Work Item i.e. the application of pre-paging to the UMTS CN. A copy of the first draft of the Pre-paging Feasibility Report is attached to this LS.

The schedule for this Work Item is that the completed Pre-paging Feasibility Report will be presented for approval at the Edinburgh meeting of TSG CN WG2 in May and at the TSG CN meeting in June.

3GPP TSG-CN WG2 **Tdoc 3GPP N2-99 176**
ETSI STC SMG3 Working Party 'C' **Tdoc SMG3 3C99-476**
Issy les Moulineaux, FRANCE
22nd -26th March 1999

Title: **Draft Technical Report: Pre-paging in the UMTS CN**

Source: **NEC Technologies (UK), NTC (Nippon Telecommunications Consulting)**

Agenda Item: **6.6**

This is the first draft of the technical report on Pre-paging in the UMTS CN.

1. Intellectual Property Rights
2. Foreword
3. Introduction

In a GSM mobile terminated call, the called mobile station is not paged until after the SRI/PRN procedure is completed. This results in a call path being set up through the GSM network between the GMSC and the VMSC before the mobile station has been paged. In some circumstances this call path may turn out to have been unnecessary if the mobile station does not accept the call (e.g. because the mobile was out of coverage). This represents an inefficient use of network resources.

Pre-paging has been proposed as a means of using network resources in a more efficient manner. In this context, Pre-paging in GSM/UMTS networks refers to the case where the called mobile is paged during the SRI/PRN procedure, i.e. before the MSC/VLR returns the PRN to the GMSC.

Also, this report will study whether Pre-paging is a suitable mechanism to improve the accuracy of location and status information for CAMEL. If so, this could lead to improved services for CAMEL subscribers.

4. Scope

The purpose of this ETR is to study:
1) The potential applications of Pre-paging in GSM/UMTS networks
2) The impact of Pre-paging on the GSM/UMTS specifications.
3) The interaction of Pre-paging with the work carried out by SMG2 and SMG3 on Classmarks for UMTS (i.e. Service Classmark and Terminal classmark).

5. References

6. Definitions and Abbreviations

7. Applications of Pre-paging

The potential applications of Pre-paging in UMTS are as follows:

1. Basic Pre-paging (i.e. the more efficient use of network resources when mobile terminated calls do not complete)
2. Signalling of terminal capabilities to the GMSC in Mobile Terminated calls
3. Signalling of current radio environment related capabilities (i.e. GSM, UTRAN coverage area) to the GMSC.
4. Support of active location information retrieval for the CAMEL Any Time Interrogation (ATI) service
5. Extension of the scope of Early Call Forwarding on:
   - not reachable (mobile not responding)
   - subscriber busy
   - radio congestion

7.1 Basic Pre-paging

Pre-paging in GSM/UMTS networks refers to the case where the called mobile is paged during the SRI/PRN procedure, i.e. the MSC/VLR returns the PRN to the GMSC after the mobile has responded to the paging message. This is illustrated by the following diagram**:**

The Pre-paging procedure will need to have the capability to control

- When the radio connection in the access network is to be released.
- Define the value of a supervision timer to manage the allocated radio bearer
- Control whether other normal MM/RR procedures (authentication, ciphering) can continue in parallel with incoming call setup after the initial Page Response is received from the MS. This will allow faster incoming call set-ups as access procedures in VMSC are executed in parallel with the core network procedures in GMSC.

The above control information will need to be transferred in the forward direction to the MSC/VLR. Thus the SRI and PRN messages will need to carry additional parameters.

The actual contents of the control parameters sent to the MSC/VLR are for further study.

7.2 Signalling of terminal capabilities to the GMSC/GGSN in Mobile Terminated Transactions

The ability to contact the MS for Pre-paging offers opportunities to obtain additional information from the MS in real-time very efficiently as part of generic Pre-paging procedures. This is an example of an enhanced service to CAMEL subscribers. Existing messages will be used where ever possible to "piggy-back" the additional information. The early sending of the MS terminal capabilities will be developed. This will enable decisions to be made in the core network at the earliest opportunity based on the actual status of the MS.

The Pre-paging procedures are likely to be part of the MM procedures (GSM 04.08) which are normally performed in response to Paging from the core network. This will be a one way flow of information of the MS terminal capabilities from the MS towards the core network.

The MS terminal capability information received in the core network (3G MSC/ 3G SGSN) will be transported transparently to the interrogating node in the core network (3G HLR and subsequently 3G GMSC / 3G GGSN) as part of the existing MAP procedures (GSM 09.02, GSM 03.18)

Thus the MS Terminal Capabilities will be transported to the core network in the following messages:

- Page Response (DTAP signalling)
- PRN Response (MAP signalling)
- SRI Response (MAP signalling)
- Also PSI Response (MAP), ATI Response (MAP) and Intitial DP (CAP) will be affected.

The actual contents of the MS Terminal Capabilities fields are for further study. Its relationship to the similar features in GSM will need to be considered – e.g. MS Classmark, MExE Classmark etc.

The interaction with GSM Location Services (LCS) will need to be considered. It may be possible to also return the information of the actual location of the MS as part of the generic Pre-paging procedures.

7.3 Signalling of current radio environment related capabilities (i.e. GSM, UTRAN coverage area) to the GMSC/GGSN.

The ability to contact the MS for Pre-paging offers opportunities to obtain additional information from the serving BSS / RNS in real-time very efficiently as part of general Pre-paging procedures. This is

an example of an enhanced service to CAMEL subscribers. Existing messages will be used where ever possible to "piggy-back" the additional information. The early sending of the RNS capabilities will be developed. This will enable decisions to be made in the core network at the earliest opportunity based on the actual status of the serving RNS.

This feature will enable the core network to determine the capability of the access network serving the MS i.e. whether GSM or UMTS coverage serves the MS. This real time information may be useful in the core network when there are functional differences in the access network (for example the location of the Transcoder).

These procedures are likely to be part of the BSSMAP/ RANAP procedures (GSM 08.08) which are normally performed in response to Paging from the core network. This will be a one way flow of information of the serving RNS capabilities from the RNC towards the core network.

The RNS capability information received in the core network (3G MSC/ 3G SGSN) will be transported transparently to the interrogating node in the core network (3G HLR and subsequently 3G GMSC / 3G GGSN) as part of the existing MAP procedures (GSM 09.02, GSM 03.18)

Thus the RNS Capabilities will be transported to the core network in the following messages:

- Complete Layer 3 message [Page Response] (BSSMAP/RANAP signalling)
- PRN Response (MAP signalling)
- SRI Response (MAP signalling)
- Also PSI Response (MAP), ATI Response (MAP) and Intitial DP (CAP) will be affected.

The actual contents of the RNS Capabilities field are for further study. Its relationship to the similar features in GSM will need to be considered – e.g. MS Classmark, Network Node Capability (e.g. MSC capability) etc.

The interaction with GSM Location Services (LCS) will need to be considered. It may be possible to also return the information of the actual location of the MS as part of the generic Pre-paging procedures.

7.4 Support of active location information retrieval for the CAMEL Any Time Interrogation (ATI) service

[Editor's note: this application will be described in detail within this sub-section.]

This is an example of an enhanced service to CAMEL subscribers.

7.5 Extension of the scope of Early Call Forwarding

The scope of Early Call Forwarding could be extended by Pre-paging to include Early Call Forwarding on:

- not reachable (mobile not responding)
- subscriber busy
- radio congestion

This is an example of an enhanced service to CAMEL subscribers.

8. Interaction of Pre-paging with Existing Services

8.1 Interaction with OR-LCF

[Editor's note: The impact of Pre-Paging on the Optimal Routing for Late Call Forwarding service needs further study. It is possible that Pre-Paging may make some cases of OR-LCF redundant. But Pre-Paging will not replace OR-LCF for (CFNRy) Call Forwarding on No Reply.]

The Pre-paging procedure has some similarities with the OR-LCF procedures. However there are some significant differences between the two, i.e.:

- Pre-paging does not make use of the MAP message Resume Call Handling
- In Pre-paging the call is forwarded without routing to the visited network.

8.2 Interaction With Location Services

9. Compatibility of Pre-paging with GSM Release 98 Specifications

[Editor's note: This will study the compatibility of Pre-paging with GSM specifications.]

The existing GSM specifications are likely to be impacted by Pre-paging work item. Enhancements to the following specifications may be necessary:

- GSM 03.18
- GSM 03.78
- GSM 04.08
- GSM 08.08
- GSM 09.02

9.1 Basic Pre-paging

GSM 09.02 specifies the PRN timer within the HLR to have a value of 15-30 seconds. It is for further study whether this timer is suitable for Pre-paged calls.

10. Impact of Pre-paging on GSM Release 99 Specifications

[Editor's note: Describes the detailed changes required in GSM Release 99 to implement basic Pre-paging]

11. Conclusions