3GPP TSG-T (Terminals) Meeting #24 ***TP-040088***
Seoul, Korea
2 - 4 June, 2004

3GPP TSG T WG3 Meeting #31 *T3-040295*
Berlin, Germany 27th - 30th April 2004

Title: LS on Support of multiple HPLMN codes in EF_HPLMNwAcT
Response to: **N1-040441 (T3-040213)**
Release:
Work Item:

Source: T3
To: CN1, SA1, T1
Cc: T,T2

Contact Person:

Name: **Stefan Eckardt, Giesecke & Devrient**
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Attachments: T3-040304 Support of multiple HPLMN codes
T3-040213(N1-040441) LS on HPLMNwAcT field

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1. Overall Description:

T3 discussed several input papers on HPLMN selection in relation with the field EF_HPLMNwAcT on the USIM. Two topics were addressed during this discussion:

1. discussion caused by the LS in N1-040441 on HPLMNwAcT field
2. discussion on support of multiple HPLMN codes in EF_HPLMNwAcT to overcome IMSI limitations

1.1 Response to N1-040441
T3 recognised that CN1 has made the use of EF_HPLMNwAcT in the terminal optional.

1.2 Support of multiple HPLMN codes in EF_HPLMNwAcT
The current definition of the IMSI is limited with regards to the room of numbers available for all (future) customers. In order to overcome this problem T3 has elaborated on a solution involving the HPLMNwAcT field .The T3 elaborated solution is not feasible as the HPLMNwAcT field is made optional to be used by the terminal by N1

In order to prevent such limitation T3 discussed the attached proposal in T3-040304 in the light of using the HPLMNwAcT field to add a new MCC + MNC as HPLMNs to the respective file EF_HPLMNwAcT in the USIM. The proposed CR to TS 23.122 Rel-6 modifies the existing PLMN selection procedure accordingly and in a backwards compatible way as follows:

- the MS selects and attempts registration on the HPLMN in IMSI,
- if it is not available, the MS will select and attempt registration on the HPLMN in the "HPLMN Selector with Access Technology" data field in priority order.

2. Actions:

To SA1: **T3 kindly ask SA1 to consider the above listed limitations which are caused by the limited room of numbers available for all (future) customers in the IMSI and to confirm the requirements to allow for sufficient expansion of the subscriber base.**

To CN1: **T3 kindly ask CN1 to take the above stated issues into account when elaborating on a solution to the described problem. Please also inform T3 and T1 on the result of your considerations.**

To T1: **T3 kindly ask T1 to await feedback from SA1 and CN1 on this LS before applying any related CR.**

3. Date of Next T3 Meetings:

T3#32	10-13 August 2004	New York, USA
T3#33	16-19 November 2004	Sophia Antipolis, France

3GPP TSG-T3 Meeting #31
Berlin, Germany, 27-30 April, 2004

Tdoc ⌘T3-040304

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** ⌘ **rev** **-** ⌘ Current version: **6.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [X] ME [X] Radio Access Network [ ] Core Network [ ]

Title:	⌘	Support of multiple HPLMN codes
Source:	⌘	China Mobile, Giesecke & Devrient, Axalto
Work item code:	⌘	TEI
Date:	⌘	28/04/2004
Category:	⌘	**C**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Some operators need to add a new MCC + MNC to meet the requirement of an increased customer base and to allow service expansion in the future. The current defined IMSI does not provide a large enough room of numbers to cover all (future) customers. In addition many operators' network only support the broadcast of one MCC+MNC. In order to enable users whose IMSI is made up of a new MCC+MNC to register on the current network and to regard the current HPLMN as their HPLMN, the HPLMN code need to be stored in "HPLMN Selector with Access Technology" data field. The PLMN selection procedure need be modified correspondingly. For compatibleness with current USIM, first, the MS selects and attempts registration on the HPLMN in IMSI, if it is not available, the MS will select and attempt registration on the HPLMN in the "HPLMN Selector with Access Technology" data field in priority order.
Summary of change:	⌘	The procedure of the PLMN selection should be modified to adapt to the expansion of the capacity of IMSI in the current network.
Consequences if not approved:	⌘	The MS with the USIM which has the new MCC + MNC can not register on the network which only broadcasts one HPLMN as its HPLMN. The capacity of the IMSI with a single MCC + MNC can not meet the development of some operators.

Clauses affected:	⌘	4.4.3			
Other specs affected:	⌘	**Y** / **N**	Other core specifications	⌘	31.102
		X /	Other core specifications		
		/ X	Test specifications		
		/ X	O&M Specifications		
Other comments:	⌘				

How to create CRs using this form:
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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

4.4.3 PLMN selection

The registration on the selected PLMN and the location registration are only necessary if the MS is capable of services which require registration. Otherwise, the PLMN selection procedures are performed without registration.

The "HPLMN Selector with Access Technology", "User Controlled PLMN Selector with Access Technology" and "Operator Controlled PLMN Selector with Access Technology" data fields in the SIM include associated access technologies for each PLMN entry, see 3GPP TS 31.102. The PLMN/access technology combinations are listed in priority order. If an entry includes more than one access technology, then no priority is defined for the preferred access technology and the priority is an implementation issue.

The Mobile Equipment stores a list of "equivalent PLMNs". This list is replaced or deleted at the end of each location update procedure, routing area update procedure and GPRS attach procedure. The stored list consists of a list of equivalent PLMNs as downloaded by the network plus the PLMN code of the network that downloaded the list. All PLMNs in the stored list are regarded as equivalent to each other for PLMN selection, cell selection/re-selection and handover.

~~The MS shall not use the PLMN codes contained in the "HPLMN Selector with Access Technology" data field.~~

~~NOTE 1:~~ To allow provision for multiple HPLMN codes, the HPLMN access technologies are stored on the SIM together with PLMN codes. The first entry ~~This version of the specification does not support multiple HLPMN codes and~~ in the "HPLMN Selector with Access Technology" data field is associated to the IMSI and is ~~only~~ used by the MS to get the ~~HPLMN~~ access technologies associated with the HPLMN code of the IMSI. The first HPLMN code in the data field is the PLMN code included in the IMSI.

NOTE ~~2~~1: Different GSM frequency bands (eg. 900, 1800, 1900, 400) are all considered GSM access technology. An MS supporting more than one band should scan all the bands it's supports when scanning for GSM frequencies. However GSM COMPACT systems which use GSM frequency bands but with the CBPCCH broadcast channel are considered as a separate access technology from GSM.

NOTE 2: The MS selects and attempts registration on the HPLMN in IMSI. If it is not available on the network, the MS will select and attempt registration on additional HPLMNs in the "HPLMN Selector with Access Technology" data field in priority order.

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN in IMSI, with the access technology/ies defined in the first entry of the "HPLMN Selector with Access Technology" data field(if not previously selected);

ii) Each HPLMN in the "HPLMN Selector with Access Technology" data field, starting from the second entry (in priority order);

iii) each PLMN in the "User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv~~i~~v) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

~~i~~v) other PLMN/access technology combinations with received high quality signal in random order;

vi) other PLMN/access technology combinations in order of decreasing signal quality.

4.4.3.1.2 Manual Network Selection Mode Procedure

The MS indicates whether there are any PLMNs, which are available using all supported access technologies. This includes PLMNs in the "forbidden PLMNs" list and PLMNs which only offer services not supported by the MS. An MS which supports GSM COMPACT shall also indicate GSM COMPACT PLMNs (which use PBCCH).

If displayed, PLMNs meeting the criteria above are presented in the following order:

i)- HPLMN in IMSI;

ii)- Each additional HPLMN in the "HPLMN Selector with Access Technology" data field (in priority order);

iii)- PLMNs contained in the " User Controlled PLMN Selector with Access Technology " data field in the SIM (in priority order);

iiiv)- PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv)- other PLMN/access technology combinations with received high quality signal in random order;

vi)- other PLMN/access technology combinations in order of decreasing signal quality.

4.4.3.2.1 Automatic Network Selection Mode

The MS selects and attempts registration on PLMNs, if available and allowable, in all of its bands of operation in accordance with the following order:

i) HPLMN in IMSI, with the access technology/ies defined in the first entry of the "HPLMN Selector with Access Technology"data field;

ii) Each HPLMN in the "HPLMN Selector with Access Technology" data field, starting from the second entry (in priority order);

iii) PLMNs contained in the " User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iiiv) PLMNs contained in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order) excluding the previously selected PLMN;

iv) other PLMN/access technology combinations with the received high quality signal in random order excluding the previously selected PLMN;

vi) other PLMN/access technology combinations, excluding the previously selected PLMN in order of decreasing signal quality or, alternatively, the previously selected PLMN may be chosen ignoring its signal quality;

vi) The previously selected PLMN.

Annex A (normative): HPLMN Matching Criteria

With the introduction of PCS1900 with the regulatory mandate to allocate 3-digit MNC codes, additional functionality is required to identify the HPLMN.

Assumptions

An MNC code shall consist of 2 or 3 decimal digits. In NA PCS1900, all SIMs shall store 3 digit MNCs.

Any network using a 2 digit MNC code shall broadcast the hexadecimal code "F" in place of the 3rd digit.

For PCS1900 for North America, regulations mandate that a 3-digit MNC shall be used; however during a transition period, a 2 digit MNC may be broadcast by the Network and, in this case, the 3rd digit of the SIM is stored as 0 (this is the 0 suffix rule).

With the exception of North America during the transition period:

a) Within a single country (or area identified by a MCC) all networks shall broadcast a 2 digit MNC code, or all networks shall broadcast a 3 digit MNC code. A mixture of broadcast 2 and 3 digit MNC codes is not permitted within a single country (or area identified by a MCC).

b) A network which broadcasts a 2 digit MNC code, will issue SIMs with a 2 digit MNC code in the IMSI on the SIM. A network which broadcasts a 3 digit MNC code, will issue SIMs with a 3 digit MNC code in the IMSI on the SIM.

Definitions and abbreviations

BCCH-MCC The MCC part of the LAI read from System Information type 3 messages broadcast on the BCCH by the network.

BCCH-MNC The MNC part of the LAI read from System Information type 3 messages broadcast on the BCCH by the network.

SIM-MCC The MCC part of the IMSI or of additional entries in the "HPLMN Selector with Access Technology" data field read from the SIM.

SIM-MNC The MNC part of the IMSI or of additional entries in the "HPLMN Selector with Access Technology" data field read from the SIM.

HPLMN Matching Criteria in mobiles which don't support PCS1900 for NA:

Figure A.1 illustrates the logic flow described below. The text below is normative. Figure A.1 is informative.

(1) The MS shall compare using all 3 digits of the SIM-MCC with the BCCH-MCC. If the values do not match, then the HPLMN match fails.

NOTE: If the MCC codes match, then the number of digits used for the SIM-MNC must be the same as the number of digits used for the BCCH-MNC.

(2) The MS shall read the 3rd digit of the BCCH-MNC. If the 3rd digit is Hex F, then proceed to step (4).

(3) The MS shall compare using all 3 digits of the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

(4) The MS shall compare using just the 1st 2 digits the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

This matching procedure shall be done for the MCC/MNC of the IMSI and all additional entries in the "HPLMN Selector with Access Technology" data field (i.e. starting with the second entry), until a match succeeds or all matches fail.

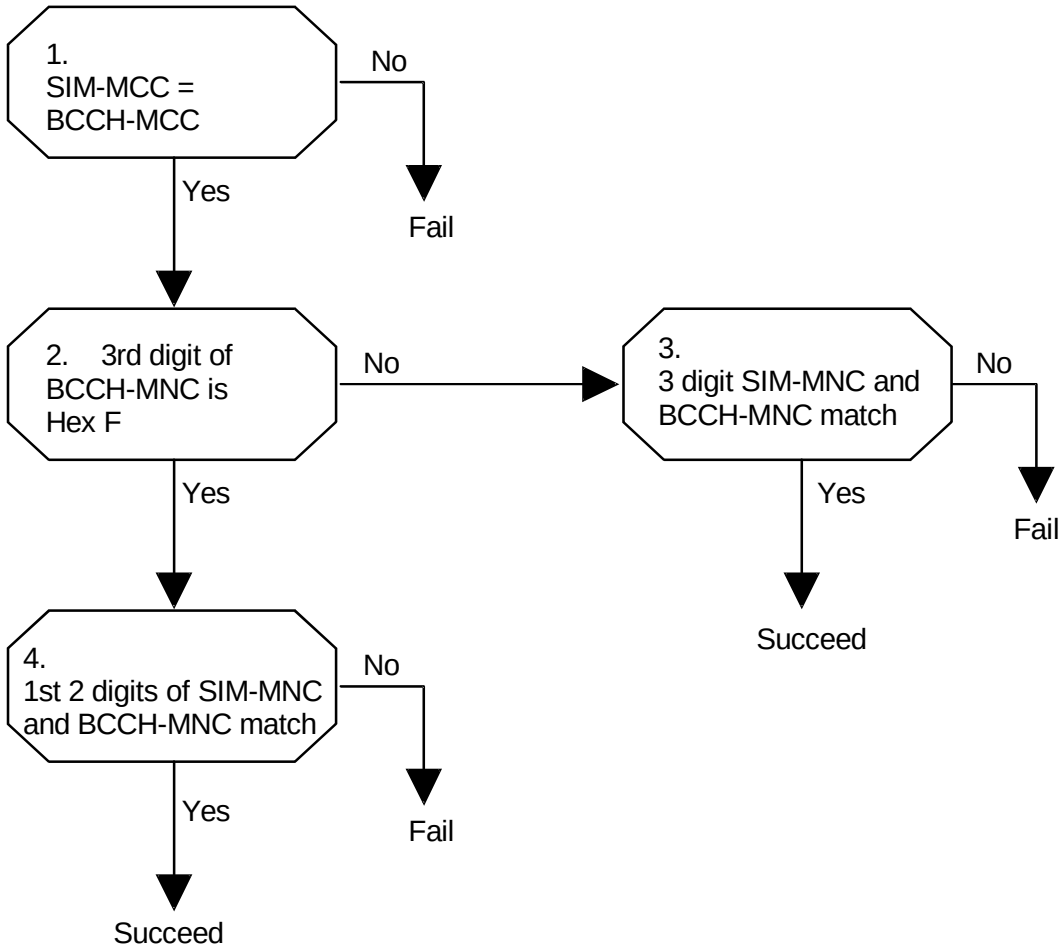

Figure A.1: HPLMN Matching Criteria Logic Flow for mobiles which support GSM and DCS1800 (informative)

HPLMN Matching Criteria for mobiles which support PCS1900 for NA:

Figure A.2 illustrates the logic flow described below. The text below is normative. Figure A.2 is informative.

(1) The MS shall compare using all 3 digits the SIM-MCC with the BCCH-MCC. If the values do not match, then the HPLMN match fails.

(2) The MS shall read the 3rd digit of the BCCH-MNC. If the 3rd digit is Hex F, then proceed to step (4).

(3) The MS shall compare using all 3 digits the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

NOTE: These rules (1) – (3) are the same as for mobiles which don't support PCS1900 for NA, except step (4) is different.

(4) The MS shall determine if the BCCH-MCC lies in the range 310-316 (i.e., whether this network is a PCS1900 for NA network). If the BCCH-MCC lies outside the range 310-316, then proceed to step (6).

(5) The MS shall compare the 3rd digit of the SIM-MNC with '0'. If the 3rd digit is not '0' then the HPLMN match fails.

NOTE: This is the '0' suffix rule.

(6) The MS shall compare using just the 1st 2 digits of the SIM-MNC with the BCCH-MNC. If the values match, then the HPLMN match succeeds, otherwise the HPLMN match fails.

NOTE: When PCS1900 for NA switches over to broadcasting 3 digit MNCs in **all** networks, then the additional requirements for PCS1900 for NA can be deleted.

This matching procedure shall be done for the MCC/MNC of the IMSI and all additional entries in the "HPLMN Selector with Access Technology" data field (i.e. starting with the second entry), until a match succeeds or all matches fail.

Guidance for Networks in PCS1900 for NA

There may be some problems in the transition period from broadcasting 2 MNC digits to broadcasting 3 MNC digits. Here are some guidelines to avoid these problems.

(1) Existing network codes. Operators who currently use a 2 digit BCCH-MNC **xy** should use the new code **xy0**.

(2) New operators allocated 3 digit MNC codes with the same 1st 2 digits as an existing operator shall not use a 3rd digit of 0.

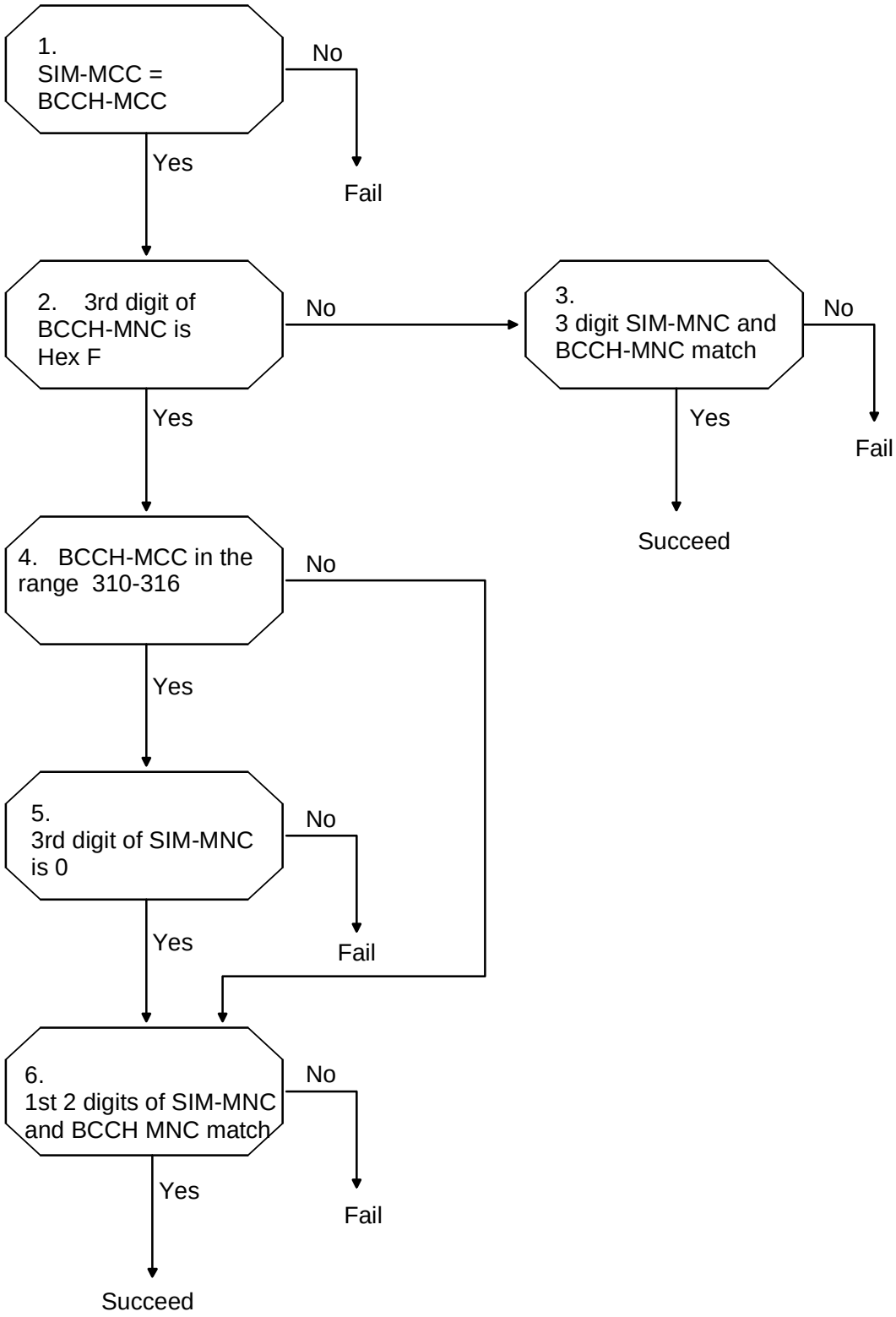

Figure A.2: HPLMN Matching Criteria Logic Flow for mobiles which support PCS1900 for NA (informative)

3GPP TSG T WG3 Meeting #31 ***T3-040213***
Berlin, Germany 27th - 30th April 2004

3GPP TSG-CN1 Meeting #33 **Tdoc N1-040441**
Atlanta, Georgia, USA 16 – 20 February 2004

Title: LS on HPLMNAcT field
Response to:
Release:
Work Item:

Source: CN1
To: TSG T1
Cc: TSG T3

Contact Person:
Name: Hannu Hietalahti
Tel. Number: +358 40 5021724
E-mail Address: hannu.hietalahti@nokia.com

Attachments: N1-040242

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1. Overall Description:

CN1 has agreed the attached 23.122 CR 068 on the use of HPLMNAcT USIM field.

This CR does not intend to remove the USIM field HPLMNAcT, but to make it optional for the UE to use it in HPLMN search.

The CR is on Rel-6 version of the protocol but there is no technical reason why it could not be supported by UEs based on earlier versions of the protocol, starting from R99 onwards.

2. Actions:

To TSG CN group.

ACTION:

T1 is requested to study if this change impacts any of the existing test cases and to make the corresponding changes to the relevant test cases, if necessary.

3. Date of Next TSG-CN1 Meetings:

CN1_34	10th – 14th May 2004	Zagreb, Croatia (EF3)
CN1_35	16th – 20th August 2004	Sophia Antipolis, France (ETSI)

3GPP TSG-CN1 Meeting #33 **Tdoc N1-040242**
Atlanta, Georgia, USA 16 – 20 February 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.122** **CR** **068** ⌘ **rev** **-** ⌘ Current version: **5.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [ ] Core Network [ ]

Title:	⌘	Usage of HPLMNAcT by the UE
Source:	⌘	Nokia
Work item code:	⌘	TEI-6
Date:	⌘	6/2/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	In many cases the ME can find HPLMN well before the USIM initialisation is completed. Therefore mandatory requirement to wait until HPLMNAcT field can be read from USIM does not speed up finding HPLMN, but can sometimes delay it considerably.
Summary of change:	⌘	The HPLMNAcT field is still kept in the USIM, but the use of it is made optional. The priorities of different PLMNs in PLMN selection are not affected, since the MS still shall search for HPLMN in all supported access technologies and frequency bands.
Consequences if not approved:	⌘	Waste of user's time and MS battery drain in unnecessary PLMN scans.

Clauses affected:	⌘	4.4.3.1.1.			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
		X		Test specifications	3GPP TS 34.123-1, TC 6.2.1.2, possibly also 6.1.1.4, 6.2.1.1, 6.2.1.6 and 6.2.1.9
			X	O&M Specifications	
Other comments:	⌘				

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

4.4.3.1.1 Automatic Network Selection Mode Procedure

The MS selects and attempts registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN (if not previously selected);

ii) each PLMN in the "User Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iii) each PLMN in the "Operator Controlled PLMN Selector with Access Technology" data field in the SIM (in priority order);

iv) other PLMN/access technology combinations with received high quality signal in random order;

v) other PLMN/access technology combinations in order of decreasing signal quality.

When following the above procedure the following requirements apply:

a) An MS with voice capability shall ignore PLMNs for which the MS has identified at least one GSM COMPACT.

b) In A/Gb mode or GSM COMPACT, an MS with voice capability, or an MS not supporting packet services shall not search for CPBCCH carriers.

c) In ii and iii, the MS should limit its search for the PLMN to the access technology or access technologies associated with the PLMN in the appropriate PLMN Selector with Access Technology list (User Controlled or Operator Controlled selector list). An MS using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology.

d) In iv and v, the MS shall search for all access technologies it is capable of, before deciding which PLMN to select.

e) In ii, and iii, a packet only MS which supports GSM COMPACT, but using a SIM without access technology information storage (i.e. the "User Controlled PLMN Selector with Access Technology" and the "Operator Controlled PLMN Selector with Access Technology" data fields are not present) shall instead use the "PLMN Selector" data field, for each PLMN in the "PLMN Selector" data field, the MS shall search for all access technologies it is capable of and shall assume GSM COMPACT access technology as the lowest priority radio access technology.

f) In i, the MS shall search for all access technologies it is capable of. ~~The MS shall start its search using the access technologies stored in the "HPLMN Selector with Access Technology" data field on the SIM in priority order as defined in clause 4.4.3 (i.e. the PLMN/access technology combinations are listed in priority order, if an entry includes more than one access technology then n~~No priority is defined for the preferred access technology and the priority is an implementation issue, but "HPLMN Selector with Access Technology" data field on the SIM may be used to optimise the procedure.~~).~~

g) In i, an MS using a SIM without access technology information storage (i.e. the "HPLMN Selector with Access Technology" data field is not present) shall search for all access technologies it is capable of and shall assume GSM access technology as the highest priority radio access technology. A packet only MS which supports GSM COMPACT using a SIM without access technology information storage shall also assume GSM COMPACT access technology as the lowest priority radio access technology.

h) In v, the MS shall order the PLMN/access technology combinations in order of decreasing signal quality within each access technology. The order between PLMN/access technology combinations with different access technologies is an MS implementation issue.

NOTE 1: Requirements a) and b) apply also to requirement d), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if capable of GSM COMPACT.

NOTE 2: Requirements a) and b) apply also to requirement f), so a GSM voice capable MS should not search for GSM COMPACT PLMNs, even if this is the only access technology on the "HPLMN Selector with Access Technology" data field on the SIM.

NOTE 3: High quality signal is defined in the appropriate AS specification.

If successful registration is achieved, the MS indicates the selected PLMN.

If registration cannot be achieved because no PLMNs are available and allowable, the MS indicates "no service" to the user, waits until a new PLMN is available and allowable and then repeats the procedure.

If there were one or more PLMNs which were available and allowable, but an LR failure made registration on those PLMNs unsuccessful or an entry in any of the lists "forbidden LAs for roaming", or "forbidden LAs for regional provision of service" prevented a registration attempt, the MS selects the first such PLMN again and enters a limited service state.