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Foreword

This ETSI Technical Report (ETR) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI). This ETR clarifies how interworking can be obtained between Phase 2 Mobile Equipment (ME) and Phase 1 Subscriber Identity Modules (SIM) within the European Telecommunications Standards (ETS) related to the European digital cellular telecommunications system (Phase 2).

This ETR is an informative document resulting from SMG studies which are related to the European digital cellular telecommunications system. This ETR is used to publish material which is of an informative nature, relating to the use or the application of ETSs and is not suitable for formal adoption as an ETS.

This ETR corresponds to GSM technical specification, GSM 09.91, Phase 2, version 4.0.1.

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1 Scope

This ETSI Technical Report (ETR) clarifies how interworking can be obtained between Phase 2 Mobile Equipment (ME) and Phase 1 Subscriber Identity Modules (SIM) and vice versa. The objective is to explain how to ensure cross-phase compatibility.

2 References

This ETR incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETR only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1]   GSM 01.04 (ETR 100): "European digital cellular telecommunications system (Phase 2); Abbreviations and acronyms".

[2]   GSM 11.11: "European digital cellular telecommunications system (Phase 1); Specifications of the SIM - ME Interface".

[3]   GSM 11.11 (ETS 300 608): "European digital cellular telecommunications system (Phase 2); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface".

3 Definitions and abbreviations

Abbreviations used in this ETR are listed in TS GSM 01.04 [1] and TS GSM 11.11 [3].

For the purposes of this ETR the following definitions apply:

Phase 1 ME: an ME which is compliant with the relevant Phase 1 specification TS GSM 11.11 [2].

Phase 2 ME: an ME which is compliant with the relevant Phase 2 specification TS GSM 11.11 [3].

Phase 1 SIM: an SIM which is compliant with the relevant Phase 1 specification TS GSM 11.11 [2].

Phase 2 SIM: an SIM which is compliant with the relevant Phase 2 specification TS GSM 11.11 [3].

4 General

To obtain compatibility between the different phases of SIMs and Mobile Equipment the Phase 1 specification is considered as a subset of the Phase 2 specification. Any exceptions to this are identified.

This approach in general has been followed. However the requirement for introduction of the new features in subsequent phases will in some cases require deviation from this general rule. Furthermore, due to the evolution of the Phase 1 specifications, it has not been possible to ensure interworking with all potential implementations.

Phase 2 MEs support all SIMs which comply with the mandatory requirements of Phase 1, even if these SIMs do not comply with all the mandatory requirements of Phase 2. Furthermore, Phase 2 MEs should take care of potential incompatibilities with Phase 1 SIMs which could arise through use of inappropriate commands or misinterpretation of response data. Particular note should be taken of making a false interpretation of RFU bytes in a Phase 1 SIM having contradictory meaning in Phase 2; e.g. indication of EF invalidation state.

5 DCS 1800 Directory

5.1 Selection of Phase 1 DCS1800 directory

Phase 1 DCS1800 MEs will not be able to select DF_{GSM} ('7F20'). Two options for the SIM are specified in order to overcome this problem. The implementation of none or either of these options is up to the discretion of the network operator issuing the SIM.

5.1.1 Option 1

When a Phase 1 DCS1800 ME attempts to select '7F21', then the SIM automatically selects '7F20' and operates as if the field identifier was '7F21' (although in fact '7F20' is internally selected within the SIM). This means, for instance, that bytes 5 and 6 of the response data to the selection of the DF are '7F' and 21', respectively.

5.1.2 Option 2

In addition to the DF_{GSM}, the SIM may contain the "basic" Phase 1 DCS1800 directory. This directory is an immediate child of the MF and no other EFs than those shown in figure 1 are implemented. The directory $DF_{DCS1800}$ is not used by any Phase 2 ME.
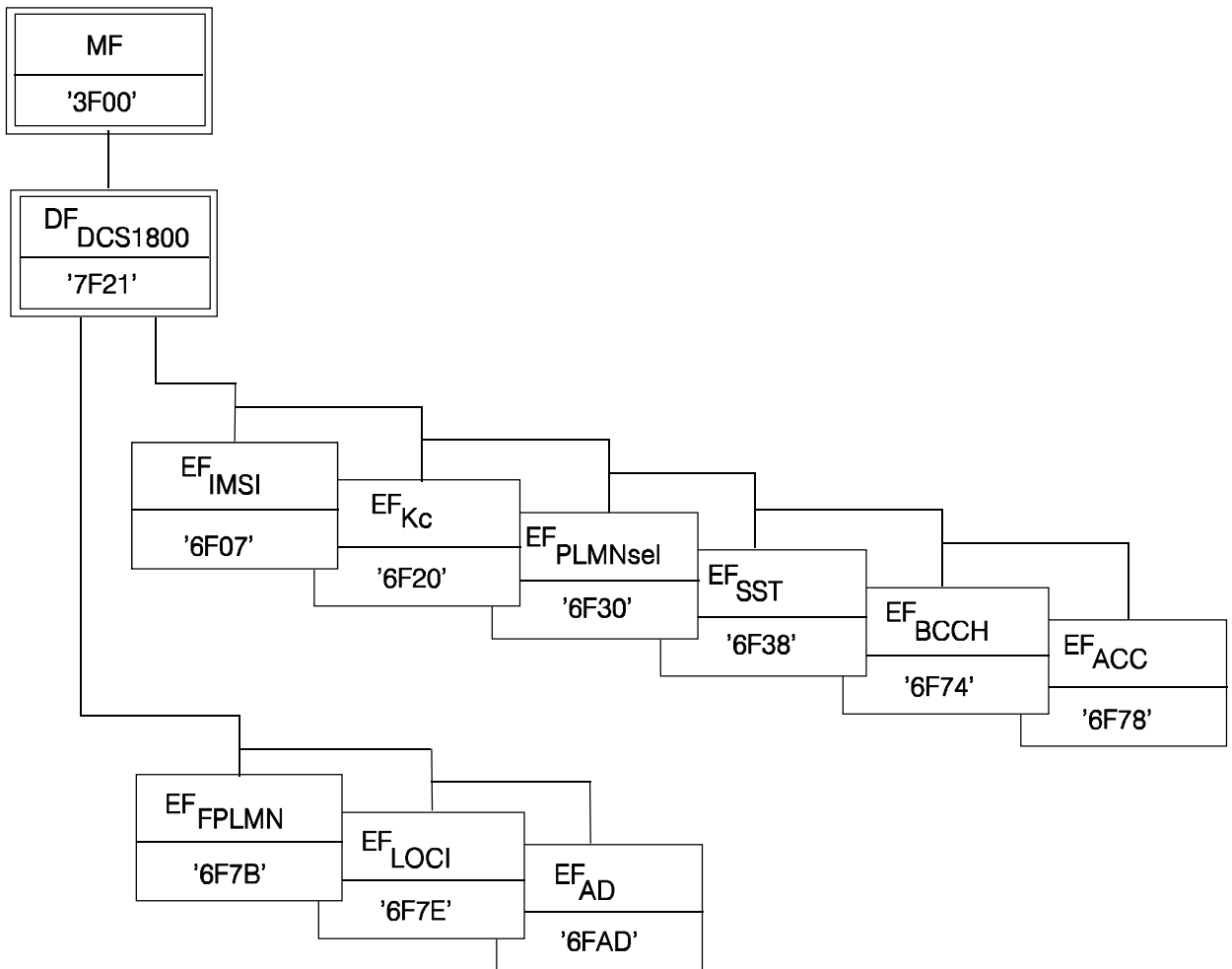
```
┌──────────────┐
│      MF      │
├──────────────┤
│    '3F00'    │
└──────────────┘
        │
┌──────────────┐
│  DF DCS1800  │
├──────────────┤
│    '7F21'    │
└──────────────┘
```

Figure 1: File identifiers and directory structure of DCS1800

If option 2 is chosen, then the coding of EF_{IMSI}, EF_{SST}, EF_{ACC} and EF_{AD} is identical to the respective EFs in the GSM directory DF_{GSM} ('7F20').

If this option is chosen, the SIM issuer must be aware of potential service and feature conflicts due to EFs in directories '7F21' and '7F20' being unsynchronised. In particular, special care should be taken with the Phase 2 features FDN and AoC. Scenarios where these conflicts may occur include:

-      transfer of a Phase 2 SIM between Phase 1 and Phase 2 DCS1800 MEs;

-      roaming between DCS and GSM networks.

5.1.2.1   Advice of Charge (AoC)

If Advice of Charge is "activated and allocated" in EF_{SST} of the DF_{GSM}, then this could lead to a problem if a Phase 1 DCS1800 ME compares the coding of the services with the EFs provided in $DF_{DCS1800}$.

5.1.2.2   Transfer of SIM between MEs

In order to ensure a good quality of service to subscribers using a SIM card having option 2 implemented, it is recommended to use in the network the IMSI attach/detach procedure. For in some cases an incoming call will not reach an MS containing such a SIM during the time interval between the insertion of the SIM into the ME and the first mobile originated procedure (location update, outgoing call, outgoing SMS, or Supplementary Service operation) is attempted.

Such a problem can only occur in the following scenario:

-      the subscriber is registered in an HLR, and is allowed to roam between DCS and GSM networks;

- this HLR updates both GSM and DCS VLRs;

- an option 2 SIM is used;

- this SIM is used in a Phase 1 DCS1800 ME;

- updating is performed in a location area, say location area "0";

- the SIM is removed, is inserted into a GSM ME and a location update is performed;

- the SIM is inserted again into a Phase 1 DCS1800 ME, in an area included in location area "0".

After this last event, incoming calls are impossible until the first outgoing procedure from this MS. If IMSI attach is enabled, a location update is performed immediately after the SIM is inserted, thereby ensuring correct information in the HLR.

6   The SLEEP command

The SLEEP command is an obsolescent GSM function which was issued by Phase 1 MEs. To achieve phase compatibility, the following procedure should be adhered to:

A SIM of Phase 2 or later always sends the status information "normal ending of the command" after the successful interpretation of the command SLEEP received from a Phase 1 ME. An ME of Phase 2 or later does not send a SLEEP command.

A Phase 1 ME waits at least two (2) elementary time units after having received the compulsory acknowledgment SW1 SW2 of the SLEEP command before it switches off the clock (if it is allowed to do so). It waits at least two (2) elementary time units before it sends the first command after having started the clock.

7   The SEEK command

The SEEK command searches through the current linear fixed EF to find a record starting with a given string. There are two types of this command which differ only in the output. For a type 1 SEEK command there is no output, but simply a pointer is set in the SIM to the record containing the given string. The type 2 SEEK command provides the same pointer and, in addition, the number of the record in which the string is contained.

A Phase 1 SIM only executes type 1 of the SEEK command. Therefore a Phase 2 ME does not use type 2 of the SEEK command with a Phase 1 SIM.

8   The SELECT and STATUS commands

The answer to the SELECT/GET RESPONSE and STATUS commands provides information related to the features introduced in Phase 2, such as CHV2/UNBLOCK CHV2, cyclic EFs, INCREASE, INVALIDATE and REHABILITATE. A Phase 2 ME does not interpret the corresponding fields in a Phase 1 SIM. The RFU bits are never interpreted by an ME in a GSM session.

9   Record Handling

The following incompatibility concerns the commands READ and UPDATE in the modes NEXT and PREVIOUS. Command parameter P2, when set to the specified value '02' or '03' means that the parameter P1 has no significance. To ensure phase compatibility between Phase 2 SIMs and Phase 1 MEs, the SIM does not interpret the value of P1 given by the ME.

10   CHV Error Codes

This clause explains how to ensure correct ME interpretation of error codes generated by a Phase 1 SIM when an incorrect CHV value is presented.

10.1   Action of the SIM

When an incorrect CHV value is presented for the first or second (consecutive) time, the error code '98' '04' (access condition not fulfilled) is returned by the SIM, irrespective of phase.

After three consecutive incorrect presentations of CHV the error code '98' '40' (unsuccessful CHV verification, CHV blocked) is returned by a Phase 2 SIM. In the same situation, a Phase 1 SIM can either return '98' '40' or '98' '04'. In the latter case, the error code '98' '40' is returned upon the fourth presentation of the CHV, even if the CHV value is correct.

10.2   Action of the Mobile Equipment

If the SIM returns the error code '98' '40' after the third consecutive incorrect CHV presentation, the ME can inform the user that the CHV is blocked and potentially request the Unblock CHV code.

If the SIM returns the error code '98' '04' after the third consecutive incorrect CHV presentation, the CHV is blocked, but the ME is not informed of this by the SIM. Therefore, the ME will allow a further attempt at CHV verification which will never be successful.

11   SIM Service table

In early Phase 1 specifications, Service n°8 was allocated to Called Party Subaddress. The presence of this EF was indicated by the allocation and activation of Service n°8 in the SIM service table. The called party subaddress EF was deleted in later Phase 1 specifications and does not exist in Phase 2. To prevent any risk of incompatibility Service n°8 should never be reassigned to another service.

12   TMSI Time

Byte 10 of EF_{LOCI} is used by Phase 1 MEs and contains the current value of the periodic location update timer (T3212). This byte is not used by Phase 2 MEs.

13   Handling of EXT1

The purge mechanism allows a Phase 2 ME to access each EF which references EF_{EXT1} for storage and to identify records in these files using extension data. All referred Extension 1 records are noted by the ME. All Extension 1 records not noted are then marked by the ME as 'free' by setting the whole record to 'FF'.

However, dependent upon the implementation of the ME, and in particular the possibility of erasure of ADN/SSC records by Phase 1 MEs, which have no knowledge of the EF_{EXT1}, it is possible for Extension1 records to be marked as "used space" (not equal to 'FF') , although in fact they are no longer associated with an ADN/SSC record.

When a Phase 2 ME stores an ADN using EXT1 and there are no free records in EXT1, then the ME checks if all EXT1 records have an associated ADN. If a record does not have an associated ADN then the ME can use this record.

14   Phase detection mechanisms

A SIM may contain the elementary file EF_{Phase} which provides information concerning the phase of a SIM. If the SIM is Phase 2 it must contain this file.

If EF_{Phase} is coded '00', the ME can assume that the SIM supports at least all mandatory Phase 1 functionality, and also that some Phase 2 features may be supported. However, it should be noted that the Services n°3 (FDN) and n°5 (AoC) can only be activated and allocated in SIMs of Phase 2 with EF_{Phase} coded '02'.

If EF_{Phase} is coded with a value between '02' to '0F' inclusive, then the ME can assume that the SIM supports at least all mandatory Phase 2 functionality.

After SIM activation, the ME selects DF_{GSM}, requests the language preference, and runs the CHV1 verification procedure. If this procedure is performed successfully, the ME then runs the SIM phase request procedure, i.e. reads EF_{Phase}. If the ME detects a SIM of Phase 1, it will omit procedures relating to FDN, and may omit those not defined for Phase 1, e.g. HPLMN Search Period Request.

Phase 1 SIMs may not have EF_{Phase}, and in this case Phase 2 MEs should care for backwards compatibility with such SIMs by taking into account extended or modified Phase 2 functionality, e.g. indication of invalidation state in the file status of an EF.

15   Advice of Charge

The following table shows service availability for the various combinations of SIM and ME in relation to the AoC subscription in the HLR. The table distinguishes between advice of charging for information purposes and that for actual charging.

Table 1: Service availability for AoC

SIM/ME Combinations	HLR Subscription		
	Non-AoC	**AoC (Information)**	**AoC (Charging)**
SIM Phase 1/ME Phase 1	OK	Subscription incompatible with SIM but service may be allowed.	Subscription incompatible with SIM
SIM Phase 1/ ME Phase 2	OK	Subscription incompatible with SIM but service may be allowed.	Subscription incompatible with SIM.
SIM Phase 2 (AoC Allocated and Activated)/ME Phase 1	OK	Service allowed, but ACM will not be incremented.	Chargeable calls will be rejected by Network. Note 1
SIM Phase 2/(AoC Allocated and Activated)/ME Phase 2	OK	OK. Note 1	OK
SIM Phase 2 (AoC not Activated)/ME Phase 1	OK	Subscription incompatible with SIM but service may be allowed	Subscription incompatible with SIM.
SIM Phase 2/(AoC not Activated)/ME Phase 2	OK	Subscription incompatible with SIM but service may be allowed.	Subscription incompatible with SIM.
NOTE 1: The SIM issuer is recommended to bar roaming to Phase 1 and Phase 2 networks not supporting AoC, to prevent calls being established and ACM not being incremented.			

History

Document history	
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