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GSM

**GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS**

Digital cellular telecommunications system (Phase 2+);
High Speed Circuit Switched Data (HSCSD) - Stage 1
(GSM 02.34)

ETSI

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Foreword

This Global System for Mobile communications Technical Specification (GTS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This GTS defines specifies the Stage 1 description of High Speed Circuit Switched Data (HSCSD) within the digital cellular telecommunications system (Phase 2+).

The contents of this GTS are subject to continuing work within TC-SMG and may change following formal TC-SMG approval. Should TC-SMG modify the contents of this GTS it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 5.x.y

where:

y   the third digit is incremented when editorial only changes have been incorporated in the specification;

x   the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

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1 Scope

This Global System for Mobile communications Technical Specification (GTS) specifies the Stage 1 description of High Speed Circuit Switched Data (HSCSD). HSCSD is a feature that allows users subscribing to the General Bearer Services to access user rates that can be achieved with one or more TCH/F. HSCSD also defines a flexible use of air interface resources which makes efficient and flexible use of higher user rates feasible.

2 Normative references

This GTS incorporates, by dated or 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 GTS 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 350): "Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms".

[2]   GSM 02.02 (ETS 300 904): "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".

[3]   GSM 02.04 (ETS 300 918): "Digital cellular telecommunications system (Phase 2+); General on supplementary services".

[4]   GSM 02.06 (ETS 300 919): "Digital cellular telecommunications system; Types of Mobile Stations (MS)".

[5]   GSM 05.02 (ETS 300 908): "Digital cellular telecommunications system (Phase 2+); Multiplexing and multiple access on the radio path".

3 Abbreviations and definitions

3.1 Abbreviations

For the purposes of this GTS, the following abbreviations apply:

HSCSD   High Speed Circuit Switched Data
MO   Mobile Originated
MT   Mobile Terminated
T   Transparent
NT   Non transparent
AIUR   Air interface user rate
FNUR   Fixed network user rate

Additional GSM related abbreviations can be found in GSM 01.04 (ETR 350) [1].

3.2 Definitions

For the purposes of this GTS, the following definitions apply:

fixed network user rate: The user rate between IWF and the fixed network

air interface user rate: The user rate between Mobile Termination and IWF. For T services it is the maximum possible AIUR not including padding. For NT services it is the maximum possible AIUR.

maximum possible AIUR: The highest possible AIUR that the multiple TCH/F can provide, e.g. 2 TCH/F using TCH/F9.6 provides a maximum possible AIUR of 19,2 kbit/s

Padding: Fill bits needed to adapt the maximum possible AIUR supported by a given number of TCH/F with a given channel coding to a FNUR that is lower than the maximum possible AIUR.

4   Description

4.1   General

HSCSD is a feature that allows users subscribing to the General Bearer Services to access user rates that can be achieved with one or more TCH/F. HSCSD also defines mechanisms for the use of air interface resources which makes efficient and flexible use of higher user rates feasible.

4.2   Applicability

HSCSD shall provide flexible ways of supporting GSM Phase 2, T and NT data services and new data services at the higher rates possible with one or more TCH/F. Data compression shall be applicable to NT HSCSD. Supplementary Services that are applicable to the General Bearer Services can be used with the HSCSD feature (Reference GSM 02.04, [3]).

4.3   General Bearer services

The General Bearer Services are defined in GSM 02.02 [2].

The General Bearer Services consist of four Bearer Services, and they are as follows:

- asynchronous;
- synchronous;
- dedicated PAD access;
- dedicated packet access.

4.4   Parameters to be indicated and negotiated

4.4.1   Call set-up

The parameters to be indicated, and negotiated, if applicable, during the call set-up shall include:

- FNUR;
- Channel coding(s) acceptable (for the call);
- Maximum number of TCH/F (that the mobile user can accept);
- Wanted AIUR (desired rate that the mobile user wants the network to allocate). The wanted AIUR is applicable to NT services only;
- Indication if the user initiated modification is required, and if so, the network resource needs.

The channel coding(s) acceptable shall be indicated by the mobile at call set-up and is not negotiable. It indicates the channel coding(s) that may be chosen by the network for the call.

The maximum number of TCH/F shall be indicated at call set-up. It enables the mobile user to limit the number of TCH/F used and thus to control an essential parameter for charging. It sets the upper limit of number of TCH/F that the network may allocate to the mobile.

The wanted AIUR (applicable to NT services only) indicates the AIUR that the mobile user wants and which the network shall try to reach but which it is not allowed to exceed. The exception where the network is allowed to exceed the wanted AIUR is when the network can achieve the AIUR with a lower number of TCH/F, e.g. wanted AIUR indicated by the mobile is 14,4 kbit/s, channel codings acceptable are both TCH/F9.6 and TCH/F4.8 and maximum number of TCH/F are 3, then the network shall choose 2 x 9,6 over 3 x 4,8 if a channel coding of TCH/F9.6 is available on two TCH/F.

If the user wishes to make use of the user initiated modification procedure, this shall be indicated at the call set-up.

It shall be possible to reserve a fixed network user rate that is considerably higher than the air interface user rate.

4.4.1.1   T services

The MS or the network may propose to modify the FNUR. The calling entity may accept or release the call. Autobauding is not allowed.

The AIUR is always equal to the FNUR.

Fax Group 3 can make use of HSCSD.

The channel coding selected must be one of the channel coding(s) indicated in the channel coding(s) acceptable parameter, the number of TCH/F selected shall not exceed the maximum number of TCH/F parameter, and the combination of the two shall result in an AIUR that is equal to the FNUR.

4.4.1.2   NT services

The MS or the network may propose to modify the FNUR. The calling entity may accept or release the call. Autobauding is allowed.

The wanted AIUR is indicated by the mobile at call set-up.

4.4.2   Network initiated modification

4.4.2.1   T services

For transparent calls the radio resource parameters must remain within limits that allow the transparent connection to maintain it is characteristics of fixed end to end throughput and delay. This means that the channel coding and the number of TCH/F used may change during the call as long as a channel coding indicated in the channel coding(s) acceptable parameter is used, the maximum number of TCH/F is not exceeded and the AIUR is kept constant.

4.4.2.2   NT services

For NT calls the network may modify the number of TCH/F and the channel coding used and thus also the AIUR during the call as long as the maximum number of TCH/F, and the channel coding(s) acceptable are all respected. The network shall try to reach the wanted AIUR indicated, as long as the resource situation allows it.

4.4.3   User initiated modification

The in-call modification feature shall be supported in case of alternate services.

4.4.3.1   T services

The user initiated modification is not applicable to T services.

4.4.3.2   NT services

The user may indicate a change of the parameters maximum number of TCH/F and wanted AIUR only.

The user initiated modification is only applicable to the data phase of alternate services.

4.5   Air Interface Resource Allocation

4.5.1   Minimum Resource Allocation and Allocation Increment

Air interface resources shall be allocated to HSCSD connections at TCH/F increments. The minimum HSCSD channel reservation shall be one TCH/F.

4.5.2 Flexible Air Interface Resource Allocation

Flexible air interface resource allocation enables:

- the network to allocate dynamically resources related to the air interface usage according to the network operator's strategy;

- the user to request a change in the air interface resource allocation based on the users data transfer needs.

4.6 Symmetric and asymmetric connections

4.6.1 Symmetric connections

For symmetric connections, air interface resources are allocated symmetrically.

4.6.2 Asymmetric connections

The provision of the asymmetric air interface connections allows simple ME (of Type 1, Reference GSM 05.02, [5]) to receive at higher rates than otherwise would be possible with a symmetric connection.

Asymmetric air interface connections that are a subset of the symmetric HSCSD, and support different air interface user rates at uplink and downlink, shall be provided.

Asymmetric air interface connections are only applicable to the downlink-biased asymmetry, i.e., where the ME is receiving at a higher rate than it is transmitting.

Asymmetric air interface connections shall only be applicable to NT HSCSD.

4.6.3 Network choice of connection symmetry

When the network has a choice of allocating either a symmetric or an asymmetric air interface connection it shall proceed as follows:

- In the case where the wanted AIUR is smaller than or equal to the wanted AIUR supported symmetrically by the MS, or asymmetric air interface connection is not supported by the network, then a symmetric air interface connection is established.

- In the case where the wanted AIUR exceeds the AIUR supported symmetrically by the MS, the network shall assign the maximum AIUR supported by the MS in the down-link, upper-bounded by the maximum number of TCH/F indicated by the mobile user, and the number of TCH/F supported by the network, maintaining the minimum of one TCH/Fin the uplink.

4.7 Mobile equipment requirements

A ME that supports HSCSD shall support one or more of the channel types TCH/F at or above 4,8 kbit/s.

Given that the ME supports a certain channel coding, the network shall be able to assume that the ME can support this channel coding in any multislot configuration allowed by its multislot class (Reference GSM 05.02, [5]).

4.8 Mobility Management

HSCSD shall be provided for within the existing supported Mobility Management.

4.9 Roaming

Roaming shall be possible.

4.10   Quality of Service

4.10.1   Bit error rate

4.10.1.1   TCH/F Bit Error Rate

The bit error rate performance of each TCH/F of a multiple TCH/F HSCSD connection shall be the same as that of a TCH/F of a single slot data call for the same channel coding.

4.10.1.2   Overall HSCSD Bit Error Rate

Any increase in the bit error rate caused by the splitting and combining of multiple TCH/F shall be kept to a minimum.

4.10.2   Radio resource management

HSCSD shall be provided for within the existing Radio Resource management control functions, including the relevant handover types. The handover shall be simultaneous for all air interface timeslots making up an HSCSD connection.

HSCSD shall be provided with full mobility.

4.10.3   Call set-up delay

Any increase in call set-up delay of the HSCSD connections compared to Phase 2 data services shall be kept to a minimum.

4.10.4   End-to-end delay

Any increase in end-to-end delay of the HSCSD connections compared to Phase 2 data services shall be kept to a minimum.

4.10.5   Throughput

The throughput for HSCSD T connections shall remain constant for the duration of the call except for the interruption of transmission at handover.

4.10.6   Network planning and interference levels

The impact of HSCSD on network planning and interference levels should be kept to a minimum.

4.11   Mapping of FNUR to TCH/F for T services

For some FNUR padding is required to adapt the maximum possible AIUR to the FNUR.

4.12   Mapping of AIUR to TCH/F for NT services

The following table indicates the mapping of AIUR to the number of TCH/F for NT services.

Table 1/GSM 02.34: Mapping of AIUR to TCH/F for NT services.

AIUR	TCH/F4.8	TCH/F9.6
4,8 kbit/s	1	N/A
9,6 kbit/s	2	1
14,4 kbit/s	3	N/A
19,2 kbit/s	4	2
28,8 kbit/s	N/A	3
38,4 kbit/s	N/A	4

4.13 HSCSD MMI aspects

It shall be possible to configure the parameters negotiated and indicated at HSCSD call set-up and during user initiated modification.

4.14 HSCSD Subscription aspects

HSCSD is not subscribed to. Users wanting to use HSCSD must subscribe to the General Bearer Services.

4.15 HSCSD charging aspects

To allow accurate charging of HSCSD calls, a record of start and stop timestamps versus the number of TCH/F, for each change in TCH/F allocation, shall be provided.

> NOTE: For MO HSCSD calls, the A party is liable for the use of all the TCH/F in her PLMN.
>
> For MT HSCSD calls, the B party may have to pay for one or more of the TCH/F in her PLMN.
>
> In case the originating or terminating subscriber is a fixed network subscriber, there shall be no additional charge (in respect of the changing use of TCH/F) for the originating or terminating fixed network subscriber.

4.16 O & M aspects

For HSCSD call, there are several new and modified parameters compared to GSM Phase 2 data calls.

For HSCSD, the air interface resource allocation may change several times during the call (network initiated and user initiated changes). It shall be possible to limit the frequency of changes per call, separately for network initiated and user initiated changes.

HSCSD connections occupy multiple TCH/F per call. It shall dynamically be possible to limit the maximum number of TCH/F allowed for HSCSD connections per cell.

4.17 HSCSD security aspects

Authentication and ciphering are applicable to HSCSD connections with no or minimal reduction in the security of the air interface.

5 Exceptional procedures or unsuccessful outcome

When a HSCSD call is offered to an entity (either MS or network) unable to support the offered HSCSD connection, it shall be possible, within the limitations of the service, to revert the call:

- to an HSCSD connection the entity can support; or
- to a GSM Phase 2 data service.

6 Interworking requirements

6.1 Service interworking

6.1.1 Interworking with supplementary services

Supplementary Services that are applicable to the General Bearer Services can be used with the HSCSD feature (Reference GSM 02.04, [3]).

6.1.2 Interworking with other services

The simultaneous use of HSCSD and SMS MO/PP, and HSCSD and SMS MT/PP services shall be possible.

6.2 Network interworking

Interworking should be arranged to all networks which are covered by GSM Phase 2 bearer services:

- PSTN;
- ISDN;
- PSPDN;
- CSPDN.

History

Document history	
November 1996	Publication of Version 5.0.1