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Digital cellular telecommunications system (Phase 2+) (GSM);
Technical performance objectives
(3GPP TS 43.005 version 15.0.0 Release 15)

3GPP™ A GLOBAL INITIATIVE
GSM® GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

Reference

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Contents

Foreword

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1 Scope

The present document contains technical performance objectives that should be met for the fixed infrastructure of GSM PLMNs. Concerning transmission delay for the PLMN in clause 4, the requirements should also be met by GSM Mobile Stations (MS)s.

These performance design objectives are applicable to all implementations at all points in the growth cycle up to the maximum size. These reference loads and performance objectives may be used by manufacturers in designing GSM PLMNs and by Administrations or Recognised Private Operating Agencies (RPOA)s in evaluating a specific design or for comparing different designs for potential use in the Administration's or RPOA's intended implementation.

1.1 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] Void.

[2] 3GPP TS 23.002: "Network architecture".

[3] 3GPP TS 43.050: "Transmission planning aspects of the speech service in the GSM Public Land Mobile Network (PLMN) system".

[4] 3GPP TS 45.010: "Radio subsystem synchronization".

[5] ITU-T Recommendation E.600: "Terms and definitions of traffic engineering".

[6] ITU-T Recommendation G.921: "Digital sections based on the 2048 kbit/s hierarchy".

[7] ITU-T Recommendation Q.541: "Digital exchange design objectives - General".

[8] ITU-T Recommendation Q.543: "Digital exchange performance design objectives".

[9] ITU-T Recommendation Q.551: "Transmission characteristics of digital exchanges".

[10] ITU-T Recommendation Q.554: "Transmission characteristics at digital interfaces of a digital exchange".

[11] ITU-T Recommendation Q.702: "Specifications of Signalling System No. 7 - Signalling data link".

[12] ITU-T Recommendation Q.706: "Message transfer part signalling performance".

[13] ITU-T Recommendation V.110: "Support of data terminal equipments (DTEs) with V-Series interfaces by an integrated services digital network".

[14] CEPT Recommendation T/S 64-30: "Digital exchange performance design objectives".

[15] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications"

[16] 3GPP TS 11.30: "Mobile Services Switching Centre Phase 1"

[17] 3GPP TS 11.31: "Home Location Register Specification Phase 1"

[18] 3GPP TS 11.32: "Visitor Location Register Specification Phase 1"

1.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 21.905 [15].

2 General

For terminology and architecture for GSM PLMNs see 3GPP TS 23.002 [2].

Interfaces, interface characteristics, connections through an MSC and ancillary functions of the MSC are defined in 3GPP TS 11.30 [16].

The functions supported by HLRs and VLRs are given in 3GPP TS 11.31 [17] and 11.32 [18].

Each MSC will be responsible for synchronisation, if required, with the fixed network to which it is connected. The requirements of ITU-T Recommendation Q.541 should be observed.

Timing and synchronisation of the radio subsystem is specified in the 3GPP TS 45.010 [4].

3 Performance design objectives

3.1 General

Part of the text is taken from ITU-T Recommendation Q.543 and part from CEPT Recommendation T/S 64-30.

3.2 MSCs

3.2.1 Reference loads

The reference loads are traffic load conditions under which the performance design objectives stated below are to be met. The following reference loads are defined.

a) Reference load for incoming inter-exchange circuits;

b) Reference load for circuit switched MS calls.

Reference load A is intended to represent the normal upper mean level of activity which Administrations or RPOA's would wish to provide for MSs, BS-MSC circuits and inter-exchange circuits. Reference load B is intended to represent an increased level beyond normal planned activity levels.

3.2.1.1 Reference load on incoming interexchange circuits

a) Reference load A

- 0,7 Erlang average occupancy on all incoming circuits with 35 call attempts/hour/incoming circuit.

  This figure assumes 45 % ineffective call attempts.

b) Reference load B

- 0,85 Erlang average occupancy on all incoming circuits with 42 call attempts/hour/incoming circuit.

3.2.1.2 Reference load for MS calls

MS calls comprise MS originating and MS terminating traffic. Terminating call attempts from PSTN/ISDN to the MS are measured at the PSTN/ISDN interface of the PLMN. Terminating call attempts as part of the intra-PLMN MS-to-MS call attempts are measured at the GMSC functionality in the VMSC.

a) Reference load A

Table 1: Traffic model for circuit switched MS calls

MS type	Average traffic intensity (Erl/sbscr)	Average BHCA/sbscr	Overall mean holding time (s)
W	0.010	0.60	60
X	0.018	1.00	65
Y	0.030	1.50	72
Z	0.050	2.00	90

The data sets for MS types W through Y are chosen to cover field observations in various continents, countries and regions. With an increase of traffic per subscriber, the overall mean holding time tends to increase. The set Z is chosen as an extreme value, expressing the expectation that such a large value should only be observed in association with a substantially increased overall mean holding time.

b) Reference load B

Reference load B is defined as a traffic increase over reference load A of:

+ 20% in Erlangs and.

+ 20% in BHCA.

3.2.1.3 Impact of supplementary services

If the reference model MSC assumes that significant use is made of supplementary services, the performance of the MSC can be strongly affected, especially in designs where processor capacity can become a limiting item. The performance delays recommended can be significantly lengthened at a given call load under such circumstances. The Administration or Operating Agency defining the reference model should estimate the fractions of calls which use various supplementary services so that an average processor impact relative to a basic telephone call can be calculated.

3.2.2 Inadequately handled call attempts

3.2.2.1 Definition

Inadequately handled call attempts are attempts which are blocked (as defined in ITU-T E.600 series of Recommendations) or are excessively delayed within the exchange. "Excessive delays" are those that are greater than three times the "0,95 probability of not exceeding" values recommended in the tables.

For originating and transit calls, this inadequately handled call attempt parameter applies only when there is at least one appropriate outlet available.

3.2.2.2 Probability of inadequately handled call attempts occurring

The values in table 2 are recommended.

Table 2

Type of connection	Reference Load A	Reference load B
Internal	≤10-2	≤4 x 10-2
Originating	≤5 x 10-3	≤3 x 10-2
Terminating	≤2 x 10-3	≤2 x 10-2
Transit	≤10-3	≤10-2

3.2.3 Delay probability

The following notes apply to the delay parameters included in this section:

1) The term "mean value" is understood as the expected value in the probabilistic sense.

2) The terms "received from" and "passed to" the signalling system are meant to be that instant at which the information is exchanged between the signalling data link (layer 1) and the signalling link functions (layer 2) in ITU-T Signalling System No. 7. For Dm channel signalling it is designated as that instant when the information is exchanged between the data link layer (layer 2) and the network layer (layer 3) by means of primitives. Consequently, the specified time intervals exclude the layer 1 and layer 2 times. However, they do include queuing delay in the absence of disturbances, but not additional queuing caused by retransmission of signalling messages.

3) It is indicated where processing phases handled in entities other than the MSC/VLR are included in the defined call phases; estimates likely to give the correct order of magnitude for the overall delay are given. This makes it easy to re-use monitoring equipment available for exchanges for the MSC/VLR. It also gives an indication of the call handling delays to be expected in a mobile network.

3.2.3.1 User signalling acknowledgement delay

User signalling acknowledgement delay is the interval from the instant a user signalling message has been received from Dm channel until a message acknowledging the receipt of that message is passed back from the MSC to Dm channel. Examples of such messages are SETUP ACKNOWLEDGEMENT to SETUP, CONNECT ACKNOWLEDGEMENT to CONNECT, and RELEASE ACKNOWLEDGEMENT to RELEASE.

The values in table 3 are recommended.

Table 3

	Reference load A	Reference load B
Mean value	≤400 ms	≤800 ms
0.95 probability of not exceeding	600 ms	1000 ms

3.2.3.2 Signalling transfer delay

The MSC signalling transfer delay is the time taken for the MSC to transfer a message from one signalling system to another with minimal or no other exchange actions required. The interval is measured from the instant that a message is received from a signalling system until the moment the corresponding message is passed to another signalling system. Examples of messages are ALERT to ADDRESS COMPLETE, ADDRESS COMPLETE to ADDRESS COMPLETE, CONNECT to ANSWER, RELEASE to DISCONNECT etc. The values in table 4 are recommended for originating and terminating connections.

Table 4

	Reference load A	Reference load B
Mean value	≤200 ms	≤350 ms
0.95 probability of not exceeding	400 ms	700 ms

3.2.3.3 Through connection delay

a) For originating outgoing traffic through connection delay is defined as the interval from the instant that the signalling information required for setting up a connection through the MSC is received from the incoming signalling system to the instant that the transmission path is available for carrying traffic between the incoming and out going terminations on the MSC.

   Switching through for mobile originating calls outgoing from the MSC occurs in two stages. The first stage is for the backward path with the delay between SETUP from the MS and JOIN_PATH for the B side. The second stage is for the forward path with the delay between ANSWER and JOIN_PATH for the A side.