INTERNATIONAL TELECOMMUNICATION UNION

CCITT

E.505

THE INTERNATIONAL
TELEGRAPH AND TELEPHONE
CONSULTATIVE COMMITTEE

TELEPHONE NETWORK AND ISDN

QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

MEASUREMENTS OF THE PERFORMANCE OF COMMON CHANNEL SIGNALLING NETWORK

Recommendation E.505

Geneva, 1992

FOREWORD

The CCITT (the International Telegraph and Telephone Consultative Committee) is a permanent organ of the International Telecommunication Union (ITU). CCITT is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The Plenary Assembly of CCITT which meets every four years, establishes the topics for study and approves Recommendations prepared by its Study Groups. The approval of Recommendations by the members of CCITT between Plenary Assemblies is covered by the procedure laid down in CCITT Resolution No. 2 (Melbourne, 1988).

Recommendation E.505 was prepared by Study Group II and was approved under the Resolution No. 2 procedure on the 16th of June 1992.

CCITT NOTES

1) In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication Administration and a recognized private operating agency.

2) A list of abbreviations used in this Recommendation can be found in Annex A.

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Recommendation E.505

MEASUREMENTS OF THE PERFORMANCE OF COMMON CHANNEL SIGNALLING NETWORK

1 Introduction

In this Recommendation, measurements relating to CCITT Signalling System No. 7 are specified. The specification of measurements for CCITT Signalling system No. 6 has not been defined in such a structured way as for CCITT Signalling System No 7. However, some of the measurements indicated for CCITT Signalling System No. 7 may also be valid for CCITT Signalling System No. 6 (albeit with slight variation in meaning), and may be used for the network operations functions of the relevant networks.

Recommendation Q.752 establishes the general requirements for measurements to support operation, administration and maintenance of CCITT No. 7 signalling networks. The focus of the measurements in this Recommendation is on operation and administration of CCITT No. 7 signalling networks, i.e. for traffic engineering, network management and Quality of Service functions.

Recommendation Q.752 provides measurements requirements in the form of tables, whereas this Recommendation provides measurements according to the traffic measurement model in § 2 of Recommendation E.502, which indicates the *object* on which the measurements are performed and the *entities* that describe the quantities for which the data collection must be performed.

This Recommendation is intended to be supportive of and complementary to Recommendation Q.752. Most of this Recommendation is considered as the objective for traffic measurements which relate to network operations functions of planning, dimensioning and operational management of common channel signalling system networks, whereas Recommendation Q.752 provides the basic Signalling System No. 7 measurements and monitoring in support of this objective.

The measurements indicated in this Recommendation are considered appropriate for a full developed signalling network using a mesh network configuration. A selected sub-set of measurements may be sufficient for other applications.

2 Conceptual signalling measurement model

The main traffic flows in an exchange are shown in Figure 4/E.502. The conceptual model for CCITT No. 7 network signalling flows and measurements is shown in Figure 1/E.505 and is related to Figure 4/E.502.

In the model, the totality of signalling traffic is exchanged between the Message Transfer Part (MTP) and the relevant User Parts. Each User Part, in turn, exchanges signalling messages with the exchange. Logical reference points for measurement are indicated and numbered in Figure 1/E.505.

The measurement types in § 3 are associated with the relevant numbered reference points. It should be noted that all the reference points are not associated with measurement types at this time, but may be related to additional measurement types which may be specified in the future.

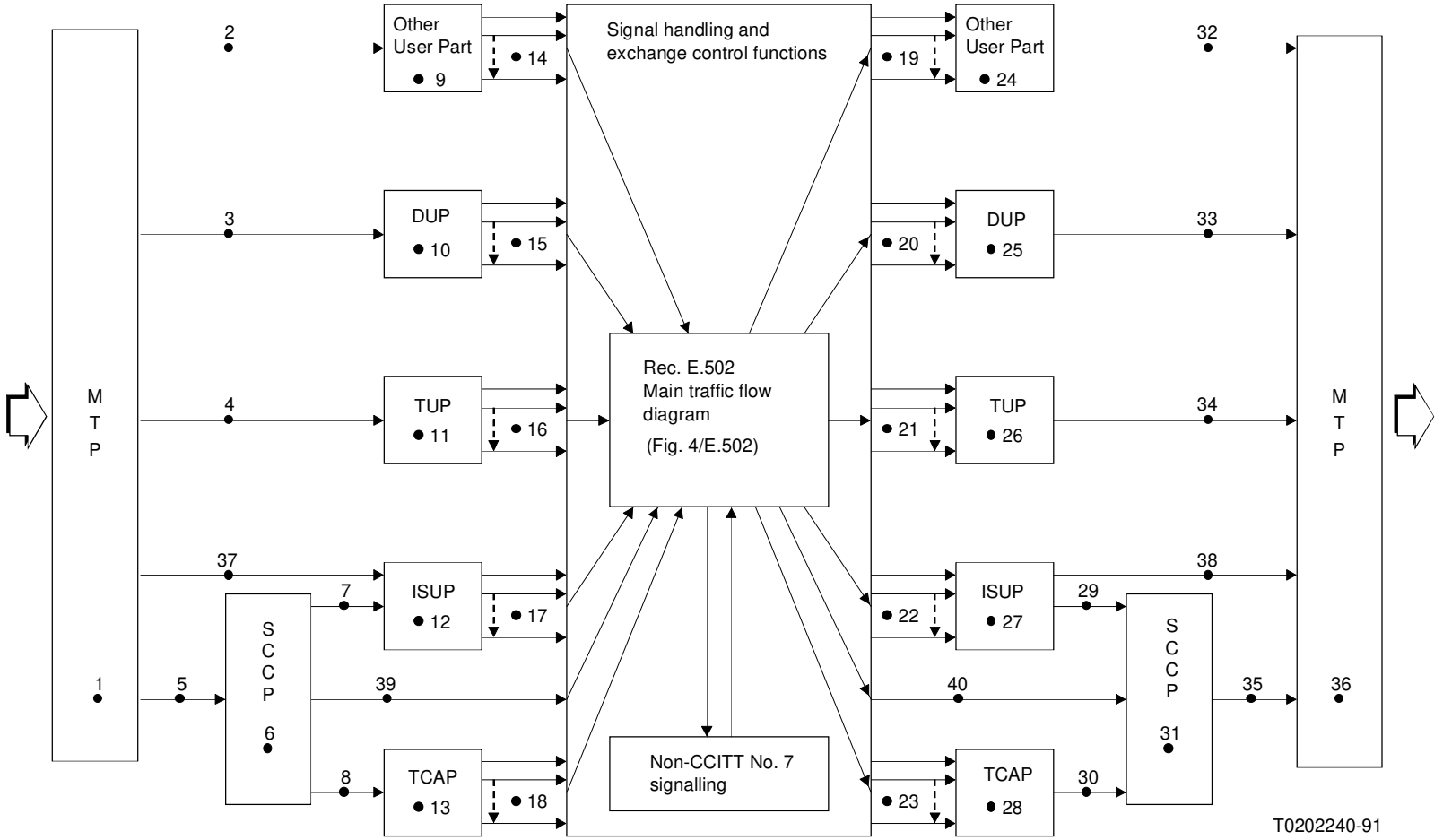

FIGURE 1/E.505

CCITT No. 7 conceptual signalling measurement model

3 Measurements types

3.1 *Message Transfer Part (MTP) measurements*

Note – The MTP is described in Recommendations Q.701 to Q.709.

Type 1: Signalling link performance (reference points 1, 36)

Object: MTP signalling links (selectable).

Entities:

a) number of local automatic changeover;

b) cumulative duration of signalling link unavailability;

c) cumulative duration of signalling link unavailability due to remote processor outage;

d) number of remote processor outage events;

e) number of local management inhibit events;

f) cumulative duration of local management inhibit status;

g) number of signal information field (SIF) octets and service information octets (SIO) transmitted;

h) number of octets retransmitted;

i) number of message signal unit (MSU) transmitted;

j) number of SIF and SIO octets received;

k) number of MSU received;

l) number of signalling link congestion events;

m) cumulative duration of signalling link congestion;

n) number of MSUs discarded due to signalling link congestion.

Type 2: Signalling link set performance (1, 36).

Object: MTP signalling link sets (selectable).

Entities:

a) cumulative duration of unavailability of signalling link set;

b) number of signalling link set unavailability events;

c) number of transfer prohibited signals (TFP) broadcasted due to failure of signalling link set (at signalling transfer points only).

Type 3: Signalling point performance (1, 36)**.**

Object: MTP signalling point (overall).

Entities:

a) number of events of adjacent signalling point (SP) inaccessible;

b) cumulative duration of adjacent SP inaccessible.

Type 4: Destination performance (36).

Object: destination point code (DPC) (selectable).

Entities:

a) number of unavailability of signalling route set to a destination, or set of destinations;

b) cumulative duration of unavailability of signalling route set to a destination, or set of destinations.

Type 5: Signalling route performance (1)**.**

Object: originating point code (OPC)/DPC combination (selectable).

Entities:

a) number of TFP messages received;

b) cumulative duration of TFP conditions;

c) number of transfer controlled (TFC) messages received;

d) cumulative duration of TFC conditions;

e) number of transfer restricted (TFR) messages received (national option);

f) cumulative duration of TFR conditions;

g) number of transfer allowed (TFA) messages received.

Type 6: Received signalling traffic distribution (1)**.**

Object: OPC (selectable).

Entities:

– number of SIF and SIO octets received.

Type 7: Transmitted signalling traffic distribution (36)**.**

Object: DPC (selectable).

Entities:

– number of SIF and SIO octets transmitted.

Type 8: TP signalling message distribution (1, 36).

Object: SIO (selectable).

Entities:

– number of SIF and SIO octets handled.

Type 9: TP received signalling message distribution (1).

Object: OPC/SIO combination (selectable).

Entities:

– number of SIF and SIO octets received.

Type 10: MTP transmitted signalling message distribution (36).

Object: DPC/SIO combination (selectable).

Entities:

– number of SIF and SIO octets transmitted.

Type 11: Detailed MTP signalling message distribution (1, 36).

Object: OPC/DPC/SIO combination (selectable).

Entities:

– number of SIF and SIO octets handled.

3.2 *Signalling Connection Control Part (SCCP) measurements*

Note – The SCCP is described in Recommendations Q.711 to Q.716.

Type 12: SCCP performance (6, 31)**.**

Object: SCCP (overall).

Entities:

a) number of routing failures – no translation for address of such nature (1);

b) number of routing failures – no translation for this specific address (1);

c) number of routing failures – signalling network failure (point code not available);

d) number of routing failures – signalling network congestion;

e) number of routing failures – local sub-system failure (unavailable);

f) number of routing failures – local sub-system congestion (2);

g) number of routing failures – unequipped user (local sub-system);

h) number of routing failures – reason unknown.

Note 1 – These measurements only required at SCCP nodes with global title translation capabilities.

Note 2 – For further study.

Type 13: SCCP availability (5, 29, 30, 40)**.**

Note – While this measurement type is seen to be useful, its availability may be implementation dependent.

Object: SCCP (overall).

Entities:

a) number of start of local SCCP unavailability – failure;

b) number of start of local SCCP unavailability – maintenance made busy;

c) number of local SCCP unavailability events – congestion;

d) cumulative duration of local SCCP unavailability – all reasons.

Type 14: SCCP utilization (6, 31)**.**

Object: SCCP (overall).

Entities:

a) number of Unit Data Service (UDTS) messages sent;

b) number of UDTS messages received;

c) number of messages handled (from local or remote sub-systems);

d) number of messages intended for local sub-systems;

e) number of messages requiring global title translation (1);

f) number of messages sent (for connectionless only) (by class 0, 1);

g) number of messages received (for connection only) (by class 0, 1);

h) number of messages sent to a back up sub-system (2).

Note 1 – This measurement is only required at SCCP nodes with global title translation capabilities.

Note 2 – This measurement is system dependent.

3.3 *ISDN User Part (ISUP) measurements*

Note – The ISUP is described in Recommendations Q.761 to Q.766.

Type 15: ISUP availability (7, 22, 37)**.**

Note – While this measurement type is seen to be useful, its availability may be implementation dependent.

Object: ISUP (overall).

Entities:

a) number of start of local ISUP unavailability – failure;

b) number of start of local ISUP unavailability – maintenance made busy;

c) number of start of ISUP unavailability – congestion;

d) cumulative duration of ISUP unavailability – all reasons.

Type 16: ISUP message utilization (7, 22).

Object: ISUP message types (selectable).

Entities:

a) number of total ISUP messages sent;

b) number of total ISUP messages received.

Type 17: ISUP node performance (17)**.**

Note – This measurement type does not relate to signalling network performance; rather, it uses signalling network User Part information to indicate the performance of the network node supported by the signalling network. This measurement type relates to the total incoming traffic delivered to the node by ISUP. The unsuccessful call attempt categories are based on the ISUP cause indicator parameter, and relate to the unsuccessful call attempts that fall in the node where the measurements are taken.

Object: ISUP (overall).

Entities:

a) number of total incoming call attempts;

b) number of unsuccessful call attempts – switching congestion;

c) number of unsuccessful call attempts – no circuit available;

d) number of unsuccessful call attempts – address incomplete;

e) number of unsuccessful call attempts – temporary failure;

f) number of unsuccessful call attempts – unallocated number;

g) number of unsuccessful call attempts – busy;

h) number of unsuccessful call attempts – destination out of service;

i) number of unsuccessful call attempts – other causes.

Type 18: ISUP network performance (22)**.**

Note – This measurement type does not relate to signalling network performance; rather, it uses signalling network User Part information to indicate the performance of the associated switched network onward from the node where the measurements are taken. The unsuccessful call attempt categories are based on the ISUP cause indicator parameter received, and relate to the unsuccessful call attempts that fail in the distant node.

Object: OPC in the received message (selectable).

Entities:

a) number of total outgoing call attempts;

b) number of switching congestion indicators received;

c) number of no circuit available indicators received;

d) number of address incomplete indicators received;

e) number of temporary failure indicators received;

f) number of unallocated number indicators received;

g) number of no route to destination indicators received;

h) number of busy indicators received;

i) number of destination out of service indicators received;

j) number of other causes indicators received.

3.4 *Transaction Capabilities Application Part (TCAP) measurements*

Note – The TCAP is described in Recommendations Q.771 to Q.775.

Type 19: TCAP availability (8, 23)**.**

Note – While this measurement is seen to be useful, its availability may be implementation dependent.

Object: TCAP (overall).

Entities:

a) number of start of local TCAP unavailable – failure;

b) number of start of local TCAP unavailable – maintenance made busy;

c) number of start of local TCAP unavailable – congestion;

d) cumulative duration of local TCAP unavailable – all reasons.

Type 20: TCAP component utilization (13, 28).

Object: TCAP component type (selectable).

Entities:

a) number of components sent by the node;

b) number of components received by the node;

c) number of simultaneous TCAP transactions (for further study).

Type 21: TCAP message utilization (18, 23)**.**

Object: TCAP message types (selectable).

Entities:

a) number of TCAP messages sent by the node;

b) number of TCAP messages received by the node.

Type 22: TCAP performance (13, 28)**.**

Object: TCAP (overall).

Entities:

– Protocol error in transaction portion (abort received) with P – abort cause

  a) number of unrecognized message type;

  b) number of incorrect transaction portion;

  c) number of badly formatted transaction portion;

  d) number of unrecognized transaction identifiers (ID);

  e) number of resource limitation.

– Protocol error in component portion (reject received with general problem code)

  f) number of unrecognized component;

  g) number of mistyped component;

  h) number of badly structured component;

  i) number of unrecognized linked ID (invoke) (for further study);

  j) number of return result (RR) unexpected (for further study);

  k) number of unrecognized invoke ID (RR) (for further study);

  l) number of return error (RE) unexpected (for further study);

  m) number of unrecognized invoke ID (RE) (for further study).

– Transaction capability (TC) user generated problems (for further study)

  n) number of duplicate invoke ID;

  o) number of unrecognized operation;

  p) number of mistyped parameter;

  q) number of resource limitation;

  r) number of initiating release;

  s) number of linked response unexpected;

  t) number of unexpected linked operation;

  u) number of unrecognized error;

  v) number of unexpected error.

3.5 *Telephone User Part (TUP) measurements*

Note – The TUP is described in Recommendations Q.721 to Q.725.

Type 23: TUP availability (4, 21)**.**

Note – While this measurement type is seen to be useful, its availability may be implementation dependent.

Object: TUP (overall).

Entities:

a) number of start of local TUP unavailability – failure;

b) number of start of local TUP unavailability – maintenance made busy;

c) number of start of local TUP unavailability – congestion;

d) cumulative duration of TUP unavailability – all reasons.

Type 24: TUP message utilization (16, 21)**.**

Object: TUP message types (selectable).

Entities:

a) number of messages sent;

b) number of messages received.

Type 25: TUP node performance (16)**.**

Note – This measurement does not relate to signalling network performance; rather, it uses signalling network User Part information to indicate the performance of the network node supported by the signalling network. This measurement type relates to the total incoming traffic delivered to the node by TUP. The unsuccessful call attempt categories are based on the TUP unsuccessful backward set-up information message, and relate to the unsuccessful call attempts that fail in the node where the measurements are made.

Object: TUP (overall).

Entities:

a) number of total incoming call attempts;

b) number of unsuccessful call attempts – switching equipment congestion;

c) number of unsuccessful call attempts – circuit group congestion;

d) number of unsuccessful call attempts – national network congestion;

e) number of unsuccessful call attempts – address incomplete;

f) number of unsuccessful call attempts – call failure;

g) number of unsuccessful call attempts – subscriber busy (electrical);

h) number of unsuccessful call attempts – unallocated number;

i) number of unsuccessful call attempts – line out of service;

j) number of unsuccessful call attempts – send special information tone;

k) number of unsuccessful call attempts – access barred;

l) number of unsuccessful call attempts – digital path not provided;

m) number of unsuccessful call attempts – misdialled trunk prefix (national use).

Type 26: TUP network performance (21)**.**

Note – This measurement type does not relate to signalling network performance; rather, it uses signalling network User Part information to indicate the performance of the associated switched network onward from the node where the measurement is made. The unsuccessful call attempt categories are based on the TUP unsuccessful backward set-up information message received, and relate to the unsuccessful call attempts that fail in the distant node.

Object: OPC in the received message (selectable).

Entities:

a) number of total outgoing call attempts;

b) number of switching equipment congestion signals received;

c) number of circuit group congestion signals received;

d) number of national network congestion signals received;

e) number of address incomplete signals received;

f) number of call failure signals received;

g) number of subscriber busy signals (electrical) received;

h) number of unallocated number signals received;

i) number of line out of service signals received;

j) number of send special information tone signals received;

k) number of access barred signals received;

l) number of digital path not provided signals received;

m) number of misdialled trunk prefix signals received (national use).

3.6 *Data User Part (DUP) measurements*

Note – The DUP is described in Recommendation X.61.

Type 27: DUP availability (3, 20)**.**

Note – While this measurement type is seen to be useful, its availability may be implementation dependent.

Object: DUP (overall).

Entities:

a) number of start of local DUP unavailability – failure;

b) number of start of local DUP unavailability – maintenance made busy;

c) number of start of local DUP unavailability – congestion;

d) cumulative duration of DUP unavailability – all reasons.

Type 28: DUP message utilization (15, 20)**.**

Object: DUP message types (selectable)

Entities:

a) number of messages sent;

b) number of messages received.

Type 29: DUP node performance (15)**.**

Note – This measurement type does not relate to signalling network performance; rather, it uses signalling network User Part information to indicate the performance of the network node supported by the signalling network. This measurement type relates to the total incoming traffic delivered to the node by DUP. The unsuccessful call attempt categories are based on the DUP call rejected message, and relate to the unsuccessful call attempts that fail in the node where the measurements are made.

Object: DUP (overall).

Entities:

a) number of total incoming call attempts;

b) number of unsuccessful call attempts – network failure;

c) number of unsuccessful call attempts – number busy;

d) number of unsuccessful call attempts – access barred;

e) number of unsuccessful call attempts – changed number;

f) number of unsuccessful call attempts – not obtainable;

g) number of unsuccessful call attempts – out of order;

h) number of unsuccessful call attempts – controlled not ready;

i) number of unsuccessful call attempts – uncontrolled not ready;

j) number of unsuccessful call attempts – data circuit – terminating equipment (DCE) power off;

k) number of unsuccessful call attempts – invalid facility request;

l) number of unsuccessful call attempts – network fault in local loop;

m) number of unsuccessful call attempts – call information service;

n) number of unsuccessful call attempts – incompatible user;

o) number of unsuccessful call attempts – network congestion;

p) number of unsuccessful call attempts – degraded service;

q) number of unsuccessful call attempts – Recognized private operating agency (RPOA) out of order (national use only).

Type 30: DUP network performance (20)**.**

Note – This measurement type does not relate to signalling network performance; rather, it uses signalling network User Part information to indicate the performance of the associated circuit switched data network onward from the node where the measurement is made. The unsuccessful call attempt categories are based on the DUP call rejected messages received, and relate to the unsuccessful call attempts that fail in the distant node.

Object: OPC in the received message (selectable).

Entities:

a) number of total outgoing call attempts;

b) number of network failure signals received;

c) number of busy signals received;

d) number of access barred signals received;

e) number of changed number signals received;

f) number of not obtainable signals received;

g) number of out of order signals received;

h) number of controlled not ready signals received;

i) number of uncontrolled not ready signals received;

j) number of DCE power off signals received;

k) number of invalid facility request signals received;

l) number of network fault in local loop signals received;

m) number of call information service signals received;

n) number of incompatible user class of service signals received;

o) number of network congestion signals received;

p) number of degraded service signals received;

q) number of RPOA out of order signals received (national use only).

3.7 *Operation and Maintenance Application Part (OMAP)*

For further study.

4 Other related Recommendations

Recommendation E.500 provides information on measurements for planning purposes. Recommendation E.503 provides information on traffic measurement data analysis and Recommendation E.504 provides information on traffic measurement administration.

ANNEX A

(to Recommendation E.505)

Alphabetical list of abbreviations used in this Recommendation

DCE Data circuit-terminating equipment

DPC Destination point code

DUP Data user part

ID Identifier

ISUP ISDN user part

MSU Message signal unit

MTP Message transfer part

OMAP Operation and maintenance application part

OPC Originating point code

RE Return error

RPOA Recognized private operating agency

RR Return result

SCCP Signalling connection control part

SIF Signal information field

SIO Service information octet

SP Signalling point

TC Transaction capability

TCAP Transaction capability application part

TFA Transfer allowed

TFC Transfer controlled

TFP Transfer prohibited signal

TFR Transfer restricted

TUP Telephone user part

UDTS Unit data service