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ITU-T E.751

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OF ITU

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TELEPHONE NETWORK AND ISDN

QUALITY OF SERVICE, NETWORK MANAGEMENT AND TRAFFIC ENGINEERING

REFERENCE CONNECTIONS FOR TRAFFIC ENGINEERING OF LAND MOBILE NETWORKS

ITU-T Recommendation E.751

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T 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 World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation E.751 was prepared by the ITU-T Study Group II (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

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

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REFERENCE CONNECTIONS FOR TRAFFIC ENGINEERING OF LAND MOBILE NETWORKS

(Helsinki, 1993)

1 General

The goal of this Recommendation is to give the E.750-Series Recommendations a base to define grade of service (GOS) and traffic parameters.

The mobile reference connections are tools for clarifying and specifying teletraffic performance issues at various interfaces between the land mobile and fixed domains.

A mobile service is provided by means of a network which supports

- radio transmission;
- switching;
- mobility management functions.

The elements which constitute the network may be owned and operated by one or more system operators. Likewise, mobile services may be provided by one or more service providers. The type of network elements owned by each type of operator, and the type of services provided by each service provider, may vary in different (national and/or commercial) frameworks.

2 Reference connections

2.1 Reference connection for interconnection of separate fixed and land mobile networks

A reference connection for the case of separate mobile and fixed networks is given in Figure 1. This reference connection considers only interaction between capacity in the land mobile and the fixed domains.

Within this reference connection traffic engineering is mainly concerned with traffic flows (in the user as well as in the control plane) across the teletraffic interface A.

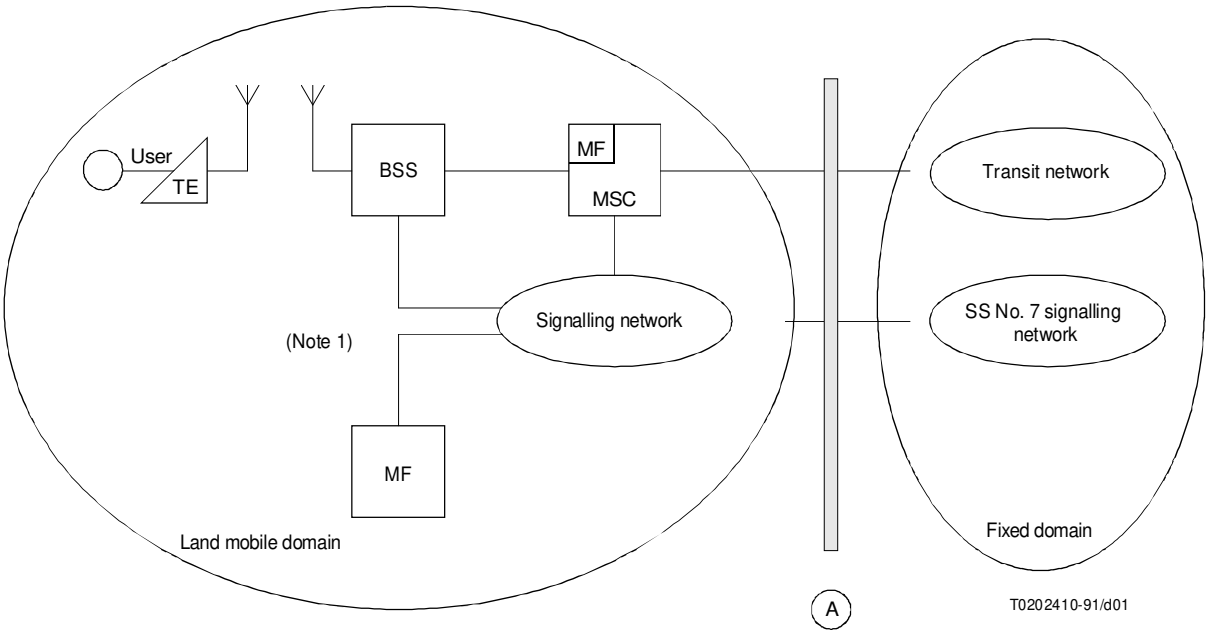
In Figure 1, within the land mobile domain, the common equipment units perform the following functions:

- MSC All the switching functions to its particular area (MSC area).
- MF The handover and location registration functions for mobile terminal equipments (TEs) in the MSC area.
- BSS Radio transmission and radio channel control. Note that BSS may include several radio equipments under the supervision of one controller equipment.

Depending on the size and the mobility behaviour of the customer base, and the cellular layout, a partitioning of the mobile switching centre functions into more sophisticated arrangements than those in Figure 1 may be envisaged, e.g. hierarchical arrangements as shown in Annex A.

2.2 Reference connection for mobile-fixed interconnection with mobile switches integrated within the fixed network

As a variation of the reference connection in 2.1, the boundary between the mobile switching centre and the transit network (PSTN/ISDN) may only be logical. In fact, the functions for managing mobile services may be physically associated with fixed network local or transit exchanges, as represented in Figure 2. The boundary between land mobile and fixed network runs then across the local or transit exchange. Further study is required to clarify the traffic implications of this boundary location.



User Originating/terminating user
BSS Base station system
MF Mobile functions
TE Terminal equipment
MSC Mobile switching centre
A Teletraffic interface between mobile and fixed network domain

NOTES

1 Information and signalling traffic flow through the air interface

2 MF can be contained in the MSC or operated separately.

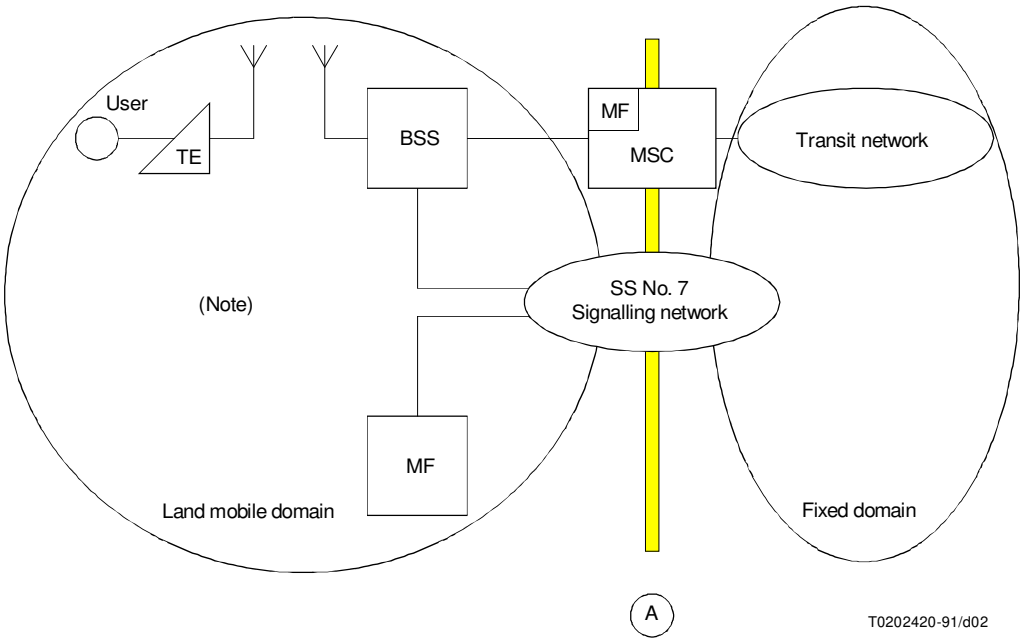
3 In some cases the signalling network in the mobile and the fixed domain may be combined.

FIGURE 1/E.751

Reference connection for separate mobile and fixed networks, and mobile originated/terminated circuit switched services

2.3 Reference connection for integrated mobile-fixed network operation

CCIR's FPLMTS (future public land mobile telecommunication systems) and "third generation" systems are in the focus of current interest in North America, Japan and Europe. An additional architecture envisages integration of mobile and fixed functions and operation, as shown in Figure 3. This architecture is built around the concept of Intelligent Network that could support personal mobility functions for such services as UPT. In Figure 3, local (or transit) exchange (le/te), mobile control node (MCN) and information storage node (ISN) are specialized units or functions within existing units, handling respectively switching, mobile control and data base functions. LE (or TE) occupies the same position as an ISDN local (or transit) exchange, MCN is responsible for location registration, security and handover handling, and ISN – a distributed data base – maintains data including location, subscriber's profile, and service information. Note that the boundary between land mobile and fixed domain lies between BSS and LE (or TE); this involves an adequate characterization of the traffic processes relevant to the engineering of the fixed network.



User	Originating/terminating user
BSS	Base station system
MF	Mobile functions
TE	Terminal equipment
MSC	Mobile switching centre
A	Teletraffic interface between mobile and fixed network domain

NOTE – Information and signalling traffic flow through the air interface

FIGURE 2/E.751

Reference connection for mobile switches integrated within the fixed network, and mobile originated/terminated circuit switched services

Note that for integrated mobile and fixed networks it is envisaged that SS No. 7 would be used in both land mobile and fixed domains.

More sophisticated arrangements than those in Figure 3 may be envisaged, e.g. those resulting in a two-hop air interface as shown in Annex B.

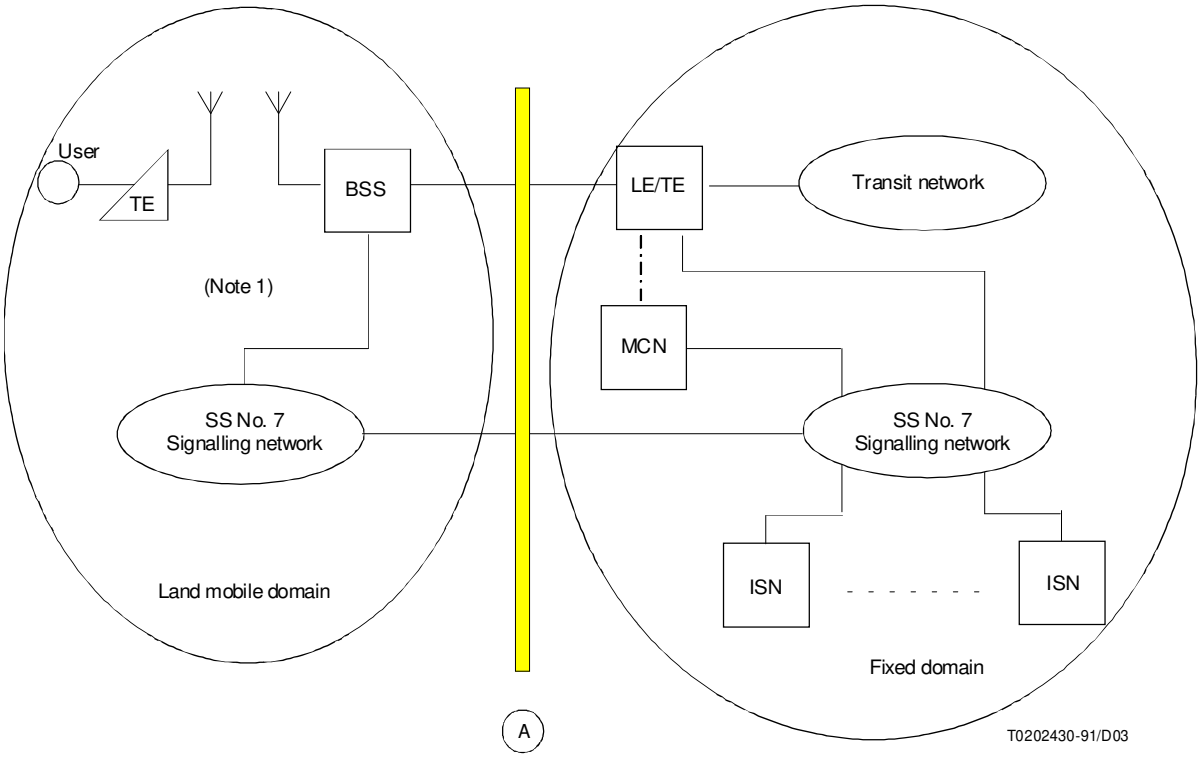
3 Existing and planned systems and reference connections

The reference connections described in 2 apply to existing or planned systems. For the purpose of providing examples, interconnection of separate fixed and land mobile networks are represented by the MCS-L1 and MCS-L2 systems (operational in Japan), the AMPS and the IS-54 systems (operational in North America), and the GSM system (operational in Europe). Examples of mobile-fixed interconnection with mobile switches integrated within the fixed network are represented by some realizations of the GSM system. Examples of interconnection of integrated fixed and land mobile networks are represented by the emerging standard for FPLMTS and the European UMTS system.

More details about these systems can be found in the Bibliography clause.

4 History

Recommendation first published in 1993.



User	Originating/terminating user
TE	Terminal equipment (mobile station)
LE/TE	Local or transit exchange
ISN	Information storage node
BSS	Base station system
MCN	Mobile control node
A	Teletraffic interface between land mobile and fixed network domain

NOTES

1 Information and signalling traffic flow through the air interface

2 MCN functions can be contained in the LE/TE, or operated separately.

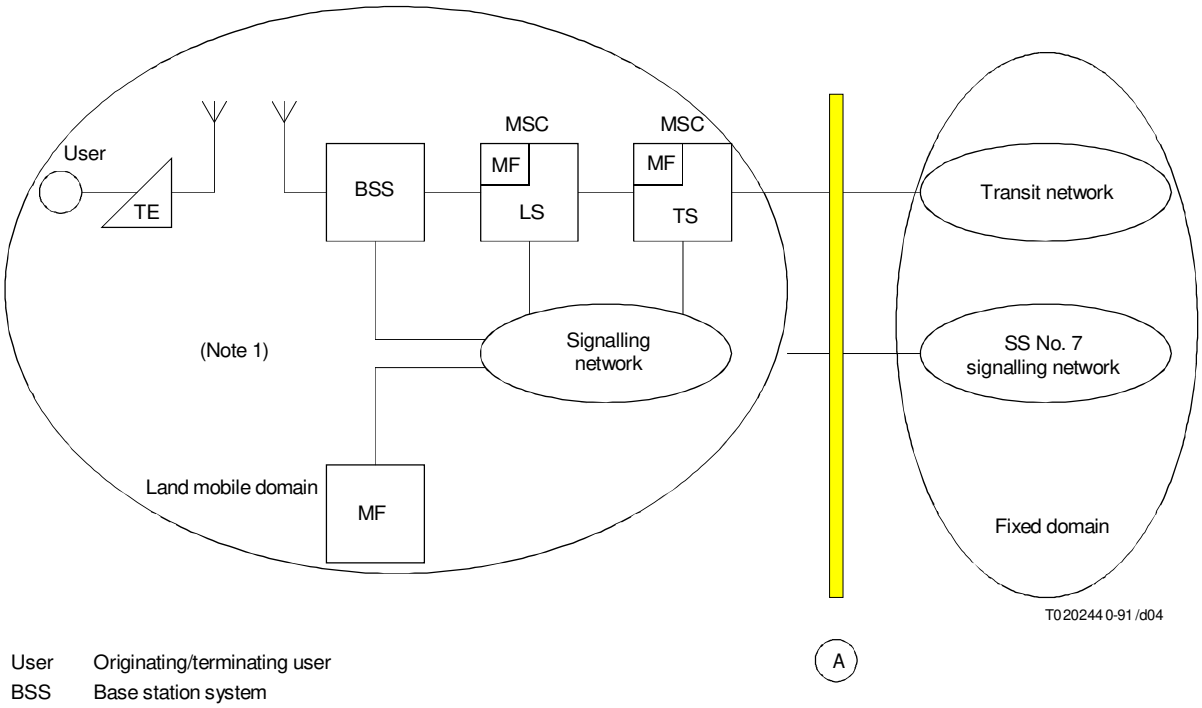
FIGURE 3/E.751

Reference connection for integrated mobile and fixed networks, and circuit-switched services

Annex A

Hierarchical arrangement of mobile switching centre functions for the reference connection of Figure 1

(This annex forms an integral part of this Recommendation)



User	Originating/terminating user
BSS	Base station system
LS	Mobile local switching function
MF	Mobile functions
TE	Terminal equipment
MSC	Mobile switching centre
TS	Mobile transit switching function
A	Teletraffic interface between mobile and fixed network domain

NOTES

1 Information and signalling traffic flow through the interface.

2 MF can be contained in the MSC or operated separately.

3 In some cases the signalling network in the mobile and the fixed domain may be combined.

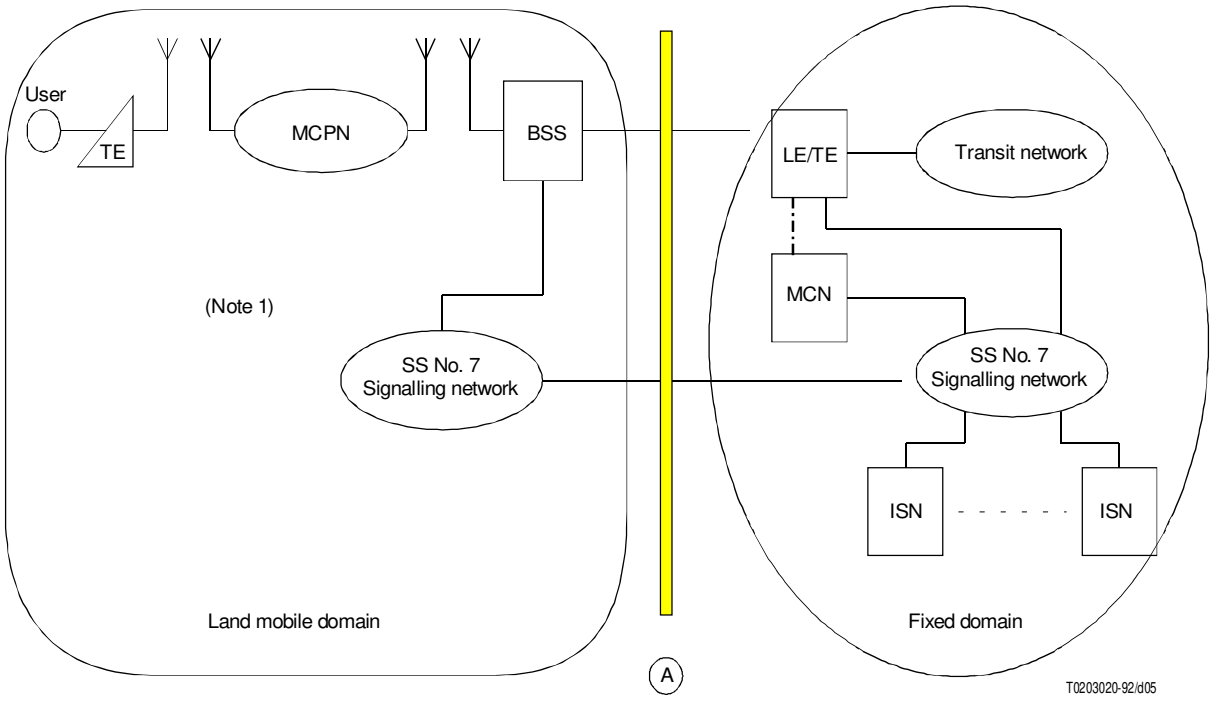
FIGURE A.1/E.751

Reference connection for separate mobile and fixed networks, hierarchical arrangement of mobile switching functions, and mobile originated/terminated circuit switched services

Annex B

Two-hop interface arrangement for the reference connection of Figure 3

(This annex forms an integral part of this Recommendation)



User	Originating/terminating user
TE	Terminal equipment (mobile station)
LE/TE	Local or transit exchange
ISN	Information storage node
BSS	Base station system
MCN	Mobile control node
MCPN	Mobile customer premises Network
A	Teletrafic interface between land mobile and fixed network domain

NOTES

1 Information and signalling traffic flow through the air interface

2 MCN functions can be contained in the LE/TE, or operated separately.

FIGURE B.1/E.751

Reference connection for integrated mobile and fixed networks with two-hop air interface arrangement, and circuit switched services

Note – A mobile customer premises network (MCPN) is a sub-network in a mobile vehicle (e.g. train, ship, car, etc.). Thus, MCPNs contain radio interfaces at both the terminal and the network side.

Annex C

List of acronyms

(This annex forms an integral part of this Recommendation)

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

BSS	Base station system
FPLMTS	Future public land mobile telecommunication systems
GOS	Grade of service
ISDN	Integrated services digital network
ISN	Information storage node
LE/TE	Local or transit exchange
MCN	Mobile control node
MCPN	Mobile customer premises network
MF	Mobile functions
PSC	Mobile switching centre
PSTN	Public switched telephone network
TE	Terminal equipment
UPT	Universal personal telecommunications

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