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SPECIFICATIONS OF SIGNALLING SYSTEM No. 7

INTRODUCTION TO CCITT SIGNALLING SYSTEM No. 7

ITU-T Recommendation Q.700

(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 Q.700 was revised by the ITU-T Study Group XI (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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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Recommendation Q.700**INTRODUCTION TO CCITT SIGNALLING SYSTEM No. 7***(Melbourne 1988; modified at Helsinki 1993)***1 General**

This Recommendation provides an overview of the Signalling System by describing the various functional elements of CCITT Signalling System No. 7 (SS No. 7) and the relationship between these functional elements. This Recommendation provides a general description of functions and capabilities of the Message Transfer Part (MTP), Signalling Connection Control Part (SCCP), Telephone User Part, ISDN User Part (ISUP), Transaction Capabilities (TC), and the Operations, Maintenance and Administration Part (OMAP) which are covered elsewhere in the Q.7xx-Series Recommendations. (This includes Recommendations Q.700 to Q.787.) However, in the case of contradiction between a particular specification and Recommendation Q.700, the particular specification shall apply.

The SS No. 7 ISDN supplementary services are described in the Q.73x-Series Recommendations.

In addition to these functions in the SS No. 7 signalling system, the Q.7xx Series Recommendations describes the SS No. 7 network structure, and also specifies the tests and measurements applicable to SS No. 7.

This Recommendation also contains information about other aspects such as SS No. 7 architecture, flow control and general compatibility rule which are not specified in separate Recommendations, and are applicable to the overall scope of SS No. 7. Recommendation Q.1400 also contains information about architecture and compatibility.

The remainder of this Recommendation describes:

- clause 2: Signalling network concepts components and modes;
- clause 3: The functional blocks within SS No. 7 and the services provided by them;
- clause 4: SS No. 7 protocol layering and its relationship to OSI modelling;
- clause 5: Node, application entity and user part addressing;
- clause 6: Operations, administration and maintenance aspects of SS No. 7;
- clause 7: Performance aspects of the functional blocks within SS No. 7;
- clause 8: Flow control for both the signalling network and within nodes;
- clause 9: Rules for evolving SS No. 7 protocols while preserving compatibility with earlier versions;
- clause 10: A cross-reference to a glossary of terms.

1.1 Objectives and fields of application

The overall objective of SS No. 7 is to provide an internationally standardized general purpose common channel signalling (CCS) system:

- optimized for operation in digital telecommunications networks in conjunction with stored program controlled exchanges;
- that can meet present and future requirements of information transfer for inter-processor transactions within telecommunications networks for call control, remote control, and management and maintenance signalling;
- that provides a reliable means for transfer of information in correct sequence and without loss or duplication.

The signalling system meets requirements of call control signalling for telecommunication services such as the telephone, ISDN and circuit switched data transmission services. It can also be used as a reliable transport system for other types of information transfer between exchanges and specialized centres in telecommunications networks (e.g. for

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management and maintenance purposes). The system is thus applicable for multipurpose uses in networks that are dedicated for particular services and in multiservices networks. The signalling system is intended to be applicable in international and national networks.

The scope of SS No. 7 encompasses both circuit related and non-circuit related signalling.

Examples of applications supported by SS No. 7 are:

- PSTN;
- ISDN;
- Interaction with Network Databases, Service Control Points for service control;
- Mobiles (Public Land Mobile Network);
- Operations Administration and Maintenance of Networks.

The signalling system is optimized for operation over 64 kbit/s digital channels. It is also suitable for operation over analogue channels and at lower speeds. The system is suitable for use on point-to-point terrestrial and satellite links. It does not include the special features required for use in point-to-multipoint operation but can, if required, be extended to cover such an application.

1.2 General characteristics

Common channel signalling is a signalling method in which a single channel conveys, by means of labelled messages, signalling information relating to, for example, a multiplicity of circuits, or other information such as that used for network management. Common channel signalling can be regarded as a form of data communication that is specialized for various types of signalling and information transfer between processors in telecommunications networks.

The signalling system uses signalling links for transfer of signalling messages between exchanges or other nodes in the telecommunication network served by the system. Arrangements are provided to ensure reliable transfer of signalling information in the presence of transmission disturbances or network failures. These include error detection and correction on each signalling link. The system is normally applied with redundancy of signalling links and it includes functions for automatic diversion of signalling traffic to alternative paths in case of link failures. The capacity and reliability for signalling may thus be dimensioned by provision of a multiplicity of signalling links according to the requirements of each application.

1.3 Components of SS No. 7

SS No. 7 consists of a number of components or functions which are defined in the Q.7xx-Series Recommendations.

<i>SS No. 7 function</i>	<i>Recommendations</i>
Message Transfer Part (MTP)	Q.701-Q.704, Q.706, Q.707
Telephone User Part (TUP) (including some supplementary services)	Q.721-Q.725
Supplementary services	Q.73x Series
Data User Part (DUP)	Q.741 (see Note)
ISDN User Part (ISUP)	Q.761-Q.764, Q.766
Signalling Connection Control Part (SCCP)	Q.711-Q.714, Q.716
Transaction Capabilities (TC)	Q.771-Q.775
Operations Maintenance and Administration Part (OMAP)	Q.750-Q.755

NOTE – Functions of the DUP are fully specified in Recommendation X.61.

Other Q.7xx-Series Recommendations which describe other aspects of the signalling system which are not part of the SS No. 7 signalling interfaces are:

<i>Title</i>	<i>Recommendations</i>
Signalling Network Structure	Q.705
Numbering of International Signalling Point Codes	Q.708
Hypothetical signalling reference connection	Q.709
PABX application	Q.710
SS No. 7 Test Specification (General)	Q.780
MTP Level 2 Test Specification	Q.781
MTP Level 3 Test Specification	Q.782
TUP Test Specification	Q.783
ISUP Test Specification	Q.784
ISUP Supplementary Service Test Specification	Q.785
SCCP Test Specification	Q.786
TCAP Test Specification	Q.787

Clause 3 describes the relationship between these components.

1.4 Description techniques in the Q.7xx-Series Recommendations

The SS No. 7 Recommendation Series defines the signalling system using prose description which is complemented by SDL diagrams and state transition diagrams. Should any conflict arise between the text and the SDL definition, the textual description is taken as definitive.

Message sequence charts or arrow diagrams are used to illustrate examples of signalling procedures, but are not considered definitive.

Data description are increasingly using ASN.1 method of description.

2 SS No. 7 signalling network

2.1 Basic concepts

A telecommunications network served by common channel signalling is composed of a number of switching and processing nodes interconnected by transmission links. To communicate using SS No. 7, each of these nodes requires to implement the necessary "within node" features of SS No. 7 making that node a signalling point within the SS No. 7 network. In addition, there will be a need to interconnect these signalling points such that SS No. 7 signalling information (data) may be conveyed between them. These data links are the signalling links of SS No. 7 signalling network.

The combination of signalling points and their interconnecting signalling links form the SS No. 7 signalling network.

2.2 Signalling network components

2.2.1 Signalling points

In specific cases there may be a need to partition the common channel signalling functions at such a (physical) node into logically separate entities from a signalling network point of view; i.e. a given (physical) node may be defined as more than one signalling point. One example is an exchange at the boundary between international and national signalling networks.

Any two signalling points, for which the possibility of communication between their corresponding User Part function exists, are said to have a signalling relation.

The corresponding concept for a given User Part is called a user signalling relation.

An example is when two telephone exchanges are directly connected by a bundle of speech circuits. The exchange of telephone signalling relating to these circuits then constitutes a user signalling relation between the Telephone User Part functions in those exchanges in their role as signalling points.

Another example is when administration of customer and routing data in a telephone exchange is remotely controlled from an operation and maintenance centre by means of communication through a common channel signalling system.

Examples of nodes in a signalling network that constitutes signalling points are:

- exchanges (switching centres);
- service control points;
- signalling transfer points;
- operation, administration and maintenance centres.

All signalling points in a SS No. 7 network are identified by a unique code known as a point code (Recommendation Q.704 refers).

2.2.2 Signalling links

The common channel signalling system uses signalling links to convey the signalling messages between two signalling points. A number of signalling links that directly interconnect two signalling points which are used as a module constitute a signalling link-set. Although a link set typically includes all parallel signalling links, it is possible to use more than one link set in parallel between two signalling points. A group of links within a link set that have identical characteristics (e.g. the same data link bearer rate) is called a link group.

Two signalling points that are directly interconnected by a signalling link are, from a signalling network structure point of view, referred to as adjacent signalling points. Correspondingly, two signalling points that are not directly interconnected are non-adjacent signalling points.

2.2.3 Signalling modes

The term “signalling mode” refers to the association between the path taken by a signalling message and the signalling relation to which the message refers.

In the associated mode of signalling, the messages relating to a particular signalling relation between two adjacent points are conveyed over a link set, directly interconnecting those signalling points.

In the non-associated mode of signalling, the messages relating to a particular signalling relation are conveyed over two or more linksets in tandem passing through one or more signalling points other than those which are the origin and the destination of the messages.

The quasi-associated mode of signalling is a limited case of the non-associated mode where the path taken by the message through the signalling network is pre-determined and, at a given point in time, fixed.

SS No. 7 is specified for use in the associated and quasi-associated modes. The Message Transfer Part does not include features to avoid out-of-sequence arrival of messages or other problems that would typically arise in a fully non-associated mode of signalling with dynamic message routing.

Examples of signalling modes are illustrated in Figure 1.

2.3 Signalling point modes

A signalling point at which a message is generated, i.e. the location of the source User Part function, is the originating point of that message.

A signalling point to which a message is destined, i.e. the location of the receiving User Part function, is the destination point of that message.

For a particular signalling relation, the two signalling points thus function as originating and destination points for the messages exchanged in the two directions between them.