Guide

for

Network-to-Network Interconnection

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NOTICE

This Guide is subject to review and revision.

1 INTRODUCTION

1.1 This Guide outlines the interconnection requirements between networks of the SBO/FBO /PTL[1] using the ITU-T Signalling System No. 7 (SS No. 7). The objective is to ensure that the SS No. 7, an internationally standardised common channel signalling system, is being used in digital telecommunications networks for reliable information transfer in call control, remote control and management and maintenance signalling.

1.2 The SS No. 7 encompasses both circuit related and non-circuit related signalling. Examples of applications supported are PSTN; ISDN; B-ISDN; Interaction with Network Databases, Service Control Points for service control; Mobiles (Public Land Mobile Network); Operations Administration and Maintenance of Networks.

1.3 The functions of the signalling system are fundamentally divided into a common Message Transfer Part (MTP) and the separate User Parts for different the users. However, the Guide will only discuss the use of SS No. 7 within the functions of the common MTP and the ISDN User Part (ISUP).

1.4 References

IDA TS DLCN 1 Issue 2 (September 2000)	Type Approval Specification for Digital Interfaces based on hierarchical bit rates of 2048 kbit/s, 34 368 kbit/s and 139 264 kbit/s
IDA RS PSTN 4 (December 1999)	Reference Specification for Call Switching Equipment with Signalling System No. 7 interface to the PSTN
IDA RS SDH 1 (December 1999)	Reference Specification for Synchronous Digital Hierarchy Interface
IDA RS SDH 3 (December 1999)	Reference Specification for Optical Interfaces Of Synchronous Digital Hierarchy (SDH) Equipment and Systems
Draft IDA RS SS7 (under discussion)	Reference Specification for Signalling System No. 7
ITU-T Recommendation G.702 (1993)	Digital Hierarchy Bit Rates
ITU-T Recommendation G.703 (1998)	Physical / electrical characteristics of hierarchical digital interfaces
ITU-T Recommendation G.704 (1998)	Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels
ITU-T Recommendation G.823 (1993)	The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy
ITU-T Recommendation G.811 (1993)	Timing requirements at the outputs of Primary Reference Clocks suitable for plesiochronous operation of international digital links
ITU-T Recommendation Q.541 (1993)	Digital Exchange Design Objectives – General
ITU-T Recommendation G.101 (1996)	The Transmission Plan
ITU-T Recommendation G.707 (1996)	Network node interface for the synchronous digital hierarchy

[1] Service-Based Operator/Facilities-Based Operator/Public Telecommunication Licensee

ITU-T Recommendation G.825 (1993)	The control of jitter and wander with digital networks which are based on the synchronous digital hierarchy
ITU-T Recommendation G.957 (1995)	Optical interfaces for equipment and systems relating to the synchronous digital hierarchy
ITU-T Recommendation I.432.1 (1996)	B-ISDN user-network interface – Physical layer specification: General characteristics
ITU-T Recommendation Q.702 (1993)	Signalling data link
ITU-T Recommendation Q.703 (1996)	Signalling link
ITU-T Recommendation Q.704 (1996)	Signalling network functions and messages
ITU-T Recommendation Q.761 (1999)	Signalling System No. 7 – ISDN user part functional description
ITU-T Recommendation Q.763 (1997)	Signalling System No. 7 – ISDN user part formats and code
ITU-T Recommendation Q.764 (1997)	Signalling System No. 7 – ISDN user part signalling procedures
ITU-T Recommendation Q.2210 (1996)	Message Transfer Part level 3 functions and messages using the services of ITU-T Recommendation Q.2140
ITU-T Recommendation Q.2140 (1995)	B-ISDN signalling at ATM adaptation layer - Service Specific Coordination Function for signalling at the Network Node Interface (SSCF at NNI)
ITU-T Recommendation Q.2761 (1995)	B-ISDN - Functional description of the B-ISDN User Part (B-ISUP) of Signalling System No. 7
ITU-T Recommendation Q.2762 (1995)	B-ISDN - General functions of messages and signals of the B-ISDN User Part (B-ISUP) of Signalling System No. 7
ITU-T Recommendation Q.2763 (1995)	B-ISDN - Signalling System No. 7 B-ISDN User Part (B-ISUP) - Formats and codes
ITU-T Recommendation Q.2764 (1995)	B-ISDN - Signalling System No. 7 B-ISDN User Part (B-ISUP) - Basic call procedures
ATM Forum - af-bici-0013.003	ATM Forum - B-ICI Specification V2.0
IEC 60950: 1999	International Electrotechnical Commission – Safety of Information Technology Equipment

2 SAFETY

2.1 Equipment at the interconnect-gateways shall be designed to comply with the principles of Singapore Standards (SS), International Electrotechnical Commission (IEC) or other safety standards e.g. IEC 60950, EN60950, BS EN41003, SS 337.

2.2 Requirements applicable to the equipment (e.g. class of equipment, type of TNV circuit and types of components) covered in the following sections of IEC 60950[2] shall be identified and complied with:

a) Scope (1.1 of IEC 60950)
b) Definitions (1.2 of IEC 60950)
c) General requirements (1.3 of IEC 60950)
d) General conditions for test (1.4 of IEC 60950)
e) Components (1.5 of IEC 60950)
f) Power interface (1.6 of IEC 60950)
g) Marking and instructions (1.7 of IEC 60950)
h) Protection from hazards (2 of IEC 60950)
i) Wiring, connections and supply (3 of IEC 60950)
j) Physical requirements (4 of IEC 60950)
k) Electrical requirements and simulated abnormal conditions (5 of IEC 60950)
l) Connection to telecommunication networks (6 of IEC 60950)

3 POINT OF INTERCONNECTION (POI)

3.1 The POI is the notional point between two interconnect-gateways as shown in Figure 1. The POI should be determined and agreed by the network operators. For fixed-to-fixed network interconnection, the interconnect-gateways of both networks would probably consist of 1 or 2 tandem exchanges.

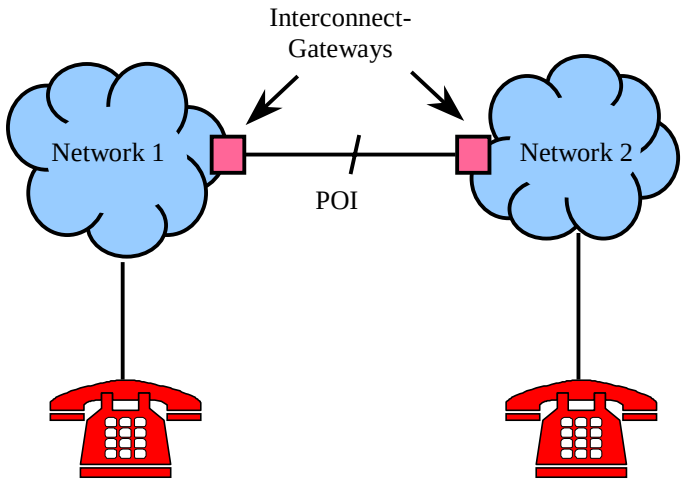

Figure 1: Interconnection between networks

4 DIGITAL TRANSMISSION

4.1 Electrical Interface at 2048 kbit/s

4.1.1 In modern networks, the tandem exchanges are digital exchanges, and digital interfaces at the hierarchical level of 2048 kbit/s should be used in the digital connection between the networks' gateways.

4.1.2 The physical and electrical characteristics of the 2048 kbit/s interface are given in Part B and Part C of IDA TS DLCN 1 issue 2.

[2] IEC 60950:1999

4.1.3 The jitter and wander tolerance at the exchange input should comply with 3.1.1/G.823 for the interface at 2048 kbit/s.

4.1.4 The Maximum time interval error (MTIE) at the exchange output is defined in ITU-T Recommendation G.811. Limits on MTIE are given in ITU-T Recommendation G.823 for the interface at 2048 kbit/s. Additional information regarding interface at 2048 kbit/s is given in ITU-T Recommendation Q.541.

4.2 Optical interfaces for interconnecting broadband networks

For optical interfaces, the Synchronous Digital Hierarchy (SDH) transmission as defined in IDA RS SDH 1 and IDA RS SDH 3, using single mode fibres at STM-1 and STM-4 should be used.

4.3 Transmission plan

The transmission plan for modern telephone networks is defined in ITU-T Recommendation G.101. The relative level at the exchange input and output points (i.e. digital interfaces) by convention is 0 dBr.

5 NETWORK SYNCHRONISATION

SBO/FBO/PTL networks shall interconnect in the plesiochronous mode of operation, with individual networks traceable to separate Primary Reference Source (PRS). The requirements for the PRS are defined in ITU-T Recommendation G.811.

6 SIGNALLING

6.1 This Guide outlines the requirements of the Message Transfer Part (MTP) for reliable transport and delivery of the ISDN User Part (ISUP) signalling information across the SS No. 7 network, and with ability to react to system and network failures. At the interconnecting nodes, only associated mode of signalling is used.

6.2 Message Transfer Part (MTP)

The functions of MTP are divided into 3 levels as shown in Figure 2:

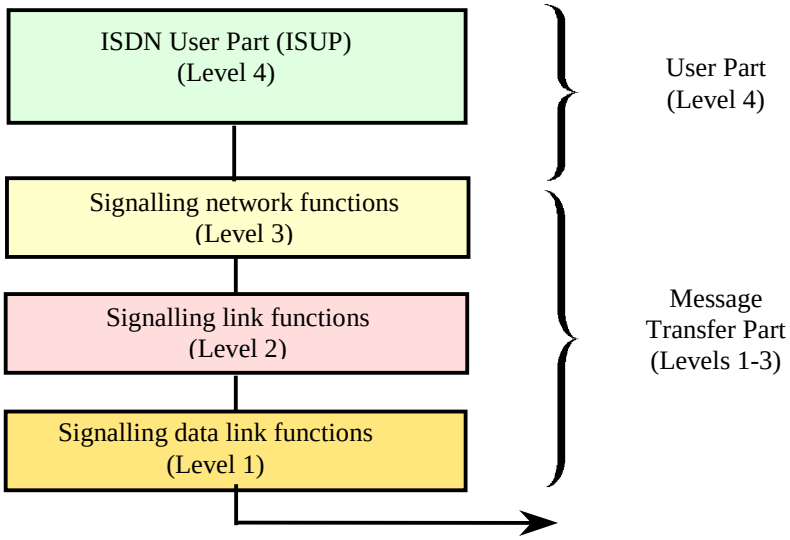

Figure 2: SS No. 7 Functional Levels

6.2.1 Signalling Data Link Functions (level 1)

6.2.1.1 Level 1 defines the physical, electrical and functional characteristics of a signalling data link and the means to access it. The level 1 element is providing a bearer for a signalling link.

6.2.1.2 The Signalling data link is derived from the 2048 kbit/s digital path that supports the standard bit rate of 64 kbit/s on digital bearer only. The interface requirements are specified in section 4.1 of this Guide. The detailed requirements for the signalling data links are specified in Part B of draft IDA RS SS7 (under discussion) with cross-references to the ITU-T Recommendation Q.702.

6.2.2 Signalling Link Functions (level 2)

6.2.2.1 Level 2 defines the functions and procedures for, and relating to, the transfer of signalling messages over one individual signalling data link. The level 2 functions together with a level 1 signalling data link as a bearer provide a signalling link for the reliable transfer of signalling messages between two points. A signalling message from the higher levels is transferred over the signalling link in variable length signal units. The signalling link functions include signal unit delimitation, signal unit alignment, error detection and correction, initial alignment, signalling link error monitoring and flow control.

6.2.2.2 The error correction by preventive cyclic retransmission is not supported. The detailed requirements for signalling link functions are given in Part C of draft IDA RS SS7 (under discussion) with cross-references to the ITU-T Recommendation Q.703.

6.2.3 Signalling Network Functions (level 3)

6.2.3.1 Level 3 defines the functions and procedures for and relating to the transfer of messages between signalling points, which are nodes of the signalling network. Signalling links, incorporating the level 1 and level 2 functions, connect the signalling points. The signalling network functions fall into two major categories, namely, the signalling message handling and the signalling network management functions.

a) The signalling message handling functions are further divided into the message routing function, the message discrimination function and the message distribution function to be used at each signalling point for delivering messages to the User Part at the destination point indicated by the sending User Part.

b) The signalling network management functions control reconfiguration of the signalling network in case of failures and control traffic in case of congestion.

6.2.3.2 For the purpose of this Guide, the signalling points are referring to the interconnecting nodes of the SBO/FBO/PTL operators.

6.2.3.2.1 Signalling Message Handling

a) Signalling messages delivered via one or more intermediate signalling point is not applicable.
b) The unauthorised use of the message transfer capability in the node is not applicable.
c) The Destination Point Code (DPC) and the Originating Point Code (OPC) for identifying the interconnecting signalling points, are fields in the routing label where IDA assigns the numbering scheme.
d) The network indicator is set to ‘10’ for national signalling traffic and set to ‘00’ for international signalling traffic.
e) Load sharing between links not belonging to the same link set is not applicable.
f) Procedures in national signalling networks using more than one congestion priority are not supported.

6.2.3.2.2 Signalling network management

a) The diversion of traffic to other signalling points in the signalling network is not applicable in the associated mode of signalling.

b) Signalling route management function is not applicable.
c) Link set normal activation is not applicable.
d) Automatic allocations of signalling terminals and signalling data links relating to the signalling link management function are not applicable.

6.2.3.3 The detailed requirements for signalling network functions are given in Part D of draft IDA RS SS7 (under discussion) with cross-references to the ITU-T Recommendation Q.704.

6.3 ISDN User Part (ISUP)

6.3.1 The ISUP is the SS No. 7 protocol, which provides the signalling functions required to support basic bearer services and supplementary services for voice and non-voice applications of the integrated services digital network (ISDN). At the interconnecting nodes, the ISUP supports the inter-working of the following services offered by the interconnecting network operators at minimum:

a) Basic call with signalling capabilities for speech/3.1 kHz audio and 64 kbit/s unrestricted data
b) Calling Line Identification Presentation (CLIP)
c) Calling Line Identification Restriction (CLIR)
d) Sub-addressing (SUB)

6.3.2 For international calls, the setting of bit A of the Forward Call Indicator parameter field of the Initial Address Message (IAM) to the value “1” is an international practice defined by ITU-T Recommendation Q.763. Calls from international network shall have this bit set to “1”.

6.3.3 Only the allocation for circuit identification code for the 2048 kbit/s digital path is supported. End-to-end signalling is not supported.

6.3.4 The ISUP messages and basic call control and signalling procedures are defined in Parts E to G of draft IDA RS SS7 1 with cross-references to the ITU-T Recommendations Q.761, Q.763 and Q.764.

6.4 B-ISDN User Part (BISUP)

The use of the BISUP as the SS No. 7 protocol (for future implementation) in broadband networks will be defined in accordance with ITU-T Recommendations Q.2210 and Q.2761 to Q.2764 and the ATM Forum B-ICI.