Technical Document TNA 134

SPARK ISDN User-Network Interface: Layer 3

PART A

General Matters

Spark nz

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LAYER 3
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CONTENTS

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1 Scope

The ISDN is defined in the I-series Recommendations of the Standardisation Bureau of the International Telecommunication Union (ITU-T), formerly the International Telegraph and Telephone Consultative Committee (CCITT). It is a plan for organising digital technology to provide advanced services to sophisticated digital terminals over an end-to-end digital network.

ISDN services are offered by the network to a user via an interface that provides either Basic access, consisting of one 16 kbit/s D-channel and up to two 64 kbit/s B-channels, or Primary rate access, consisting of one 64 kbit/s D-channel and up to 30 64 kbit/s B-channels.

This Specification describes the Layer 3 requirements for the access protocol for the Primary Rate Access and the Basic Rate Access user-network interfaces between Spark's Integrated Services Digital Network (ISDN) and a single unit of user's equipment, e.g. a terminal or small business system. This protocol applies at the T reference point or the coincident S/T reference point and to both Basic (2B + D) and Primary rate (30B + D) interfaces.

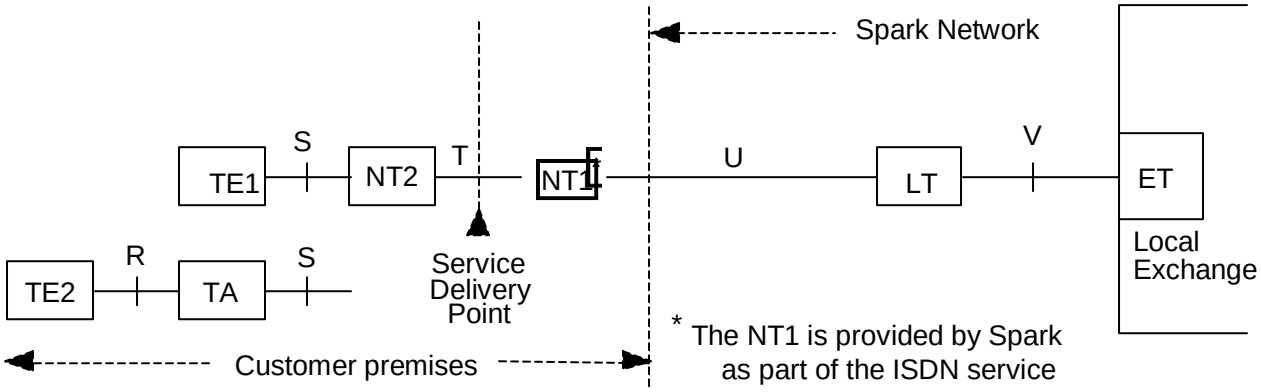

FIGURE 1/A

ISDN Access Reference Model

ET	Exchange terminal	TA	Terminal Adaptor
LT	Line Terminal	TE1	ISDN Terminal
NT1	Network Termination 1	TE2	Non-ISDN Terminal
NT2	Network Termination 2	S,T,U,V	Reference points

The NT1, LT and ET will be provided by Telecom as an inherent part of the ISDN service
The TA may also be provided with some service offerings.

The interface is functionally organised into the first three layers of the ISO Open Systems Interconnection 7-layer model, consisting of the physical layer (Layer 1), the data link layer (Layer 2) and the network layer (Layer 3). Layer 3 is the focus of this Specification.

The following Specifications together specify the requirements for ISDN connections:

	Basic Access	Primary Rate Access
Layer 1	PTC 131 [1]	PTC 132 [2]
Layer 2	TNA133 [3]	
Layer 3	TNA 134	

In the previous issue Layer 3 was documented in TNA 134 (for basic call control) and TNA 135 (for supplementary services). These are both now combined into this Specification.

2 Notations On The Implementation By Spark New Zealand Limited

This Specification is based on text closely aligned with the ITU-T Recommendations. Some changes have been made to the text in the interest of clarity. Some sections of the text have been modified to reflect those options chosen for implementation by Telecom New Zealand Limited (referred to as "Telecom" throughout the text). Other sections have notations explaining the state of implementation by Telecom. Some of the notations are listed below.

Not used by Telecom. - This option is not implemented by Telecom and it is unlikely that it will be implemented in some future enhancement.

Not currently used. - This option is not implemented by Spark at this stage but it is possible that it will be included in some future enhancement. Equipment suppliers may make provision for such enhancements.

~~Messages, information elements and other options that are not curently implemented by Telecom are marked with strikeout similar to this sentence with a revision mark in the margin.~~

Important modifications, which depart from ITU-T will be marked similar to this sentence with a revision mark in the margin. These differences may be a required choice of options or a variation to the ITU-T Recommendation. These changes are summarised in Part A, § 5.

When a complete section is not implemented then that section has been omitted.

Tables and figures have been renumbered and therefore may be different to the equivalent numbers in ITU-T Recommendations.

Some services or facilities in this Specification may not necessarily be currently implemented in Telecom's network or may not be available in some situations.

3 Organization Of The Specification

This Specification is organized into four parts.

Part A is this Introduction.

Part B describes the detailed specifications for layer 3 basic call control and is based closely on ITU-T Recommendation I.451 (Q.931) [8]. Changes relative to Q.931 are marked as indicated in clause 0 Also included in Part B are additional messages and information elements defined in ITU-T Recommendation Q.932 [9] and the Q.95x-series of Recommendations and currently implemented by Spark. These are also marked as indicated in clause 0 to show changes relative to Q.931.

Part C describes the detailed specifications for layer 3 generic supplementary service call control and is based closely on ITU-T Recommendation Q.932. Changes relative to Q.932 are marked as indicated in clause 0

Part D describes the detailed specifications for specific supplementary services and is based generally on the Q.95x-series of ITU-T Recommendations and includes additional text. Notation to describe the changes relative to the ITU-T Recommendations described in clause 2 are not used in Part D.

4 Definitions/Abbreviations

4.1 Definitions

D-Channel- A 16 kbit/s or 64 kbit/s channel carrying signalling, low speed packet switched data, and user-to-user information. (see ITU-T Recommendation I.412 [6]).

B-Channel- A 64 kbit/s channel that carries customer information such as voice, circuit switched, or packet switched data. (see ITU-T Recommendation I.412).

H0-Channel- A 384 kbit/s channel that carries customer information such as voice, circuit switched data. (see ITU-T Recommendation I.412).

PORT An interface on a piece of equipment for the purpose of supplying an output signal or accepting an input signal.

USER User's equipment e.g. terminal.

Note. The definitions of ITU-T Recommendations G.701 [4] and I.112 [5] also apply.

5 Abbreviations

ETSI European Telecommunications Standards Institute

HLC High Layer Compatibility

I Information (frame)

IA5 International Alphabet No. 5

IDI Initial Domain Identifier

IE Information Element

IEC International Electrotechnical Commission

ISDN Integrated Services Digital Network

ISO International Standards Organization

ITU International Telecommunications Union

ITU-T International Telecommunications Union - Telecommunications Standard

IWF Interworking Function

IWU Interworking Unit

LAN Local Area Network

LAPB Link Access Protocol-Balanced

LAPD Link Access Protocol on the D-channel

LLC Low Layer Compatibility

LLI Logical Link Identifier (see ITU-T Recommendation I.441 (Q.921) [7])

LSB Least Significant Bit

MSB Most Significant Bit

NACK Negative Acknowledgement

NIC Network Independent Clock

NRM Normal Response Mode (of HDLC)

NSAP	Network Service Access Point
NT1	Network Termination Type One (see ITU-T Recommendation I.411)
NT2	Network Termination Type Two (see ITU-T Recommendation I.411)
OSI	Open System Interconnection
PABX	Private Automatic Branch Exchange
PCM	Pulse Code Modulation
PH	Packet Handler
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephony Network
PVC	Permanent Virtual Circuit
RDTD	Restricted Differential Time Delay
SABME	Set Asynchronous Balanced Mode Extended (frame)
SAPI	Service Access Point Identifier (see ITU-T Recommendation Q.921)
SDL	Functional specification and description language
SPID	Service Profile Identifier
TA	Terminal Adaptor (see ITU-T Recommendation I.411)
TE1	Terminal Equipment of type 1 - ISDN terminal (see ITU-T Recommendation I.411)
TE2	Terminal Equipment of type 2 - non-ISDN terminal (see ITU-T Recommendation I.411)
TEI	Terminal Endpoint Identifier (see ITU-T Recommendations Q.920 and Q.921)
Telecom	Telecom New Zealand Limited
TID	Terminal Identifier
TSP	Terminal Service Profile
UDI	Unrestricted Digital Information
UDI-TA	Unrestricted Digital Information with Tones/Announcements
UI	Unnumbered Information (frame)
USID	User Service Identifier
VC	(Switched) Virtual Circuit

6 Summary of Differences Between this Specification, ITU-T Recommendations and ETSI Standards

The significant differences between this Specification and the ITU-T Recommendations are summarised below. These comparisons are limited mainly to the differences in basic call control.

In addition, the comparison includes differences between this Specification and ETSI (European Telecommunications Standards Institute). The comparison is based on ETSI Standards and does not necessarily represent any particular networks ETSI ISDN implementation.

	Spark	**ETSI**	**Notes**
Messages			
Congestion Control	Not implemented	optional	used in UUS2 and UUS3
User Information	Not implemented	optional	used in UUS2 and UUS3
Information elements			
Bearer capability	may not be repeated	may not be repeated	
Call reference	length 1 for BRA	length 1 for BRA	
Call reference	length 2 for PRA but will accept length 1	length 2 for PRA	
Called party number	length 27	length 23	
Calling party number	length 21	length 24	
Channel identification	Interface identifier field implemented	Interface identifier field not implemented	
Channel identification	Slot map not implemented	Slot map not implemented	
Closed user group	not implemented	not implemented	
Congestion level	not implemented	optional	used in UUS2 and UUS3
Date/time	Implemented	optional	
Display	Supports max length of 82	supports max length of 34	
End-to-end transit delay	not implemented	optional	
Facility	not implemented	optional	used for functional supplementary services
Feature activation	Implemented	not implemented	
High layer compatibility	may not be repeated	may not be repeated	
Low layer compatibility	may not be repeated	may not be repeated	
More data	not implemented	optional	used in UUS2 and UUS3
Network specific facilities	not implemented	not implemented	
Notification indicator	Bearer service change not implemented	Bearer service change not implemented	
Notification indicator	Additional codepoints identified	identified in supplementary service definitions	
Packet layer binary parameters	not implemented	optional	
Packet layer window size	not implemented	optional	
Packet size	not implemented	optional	

	Spark	**ETSI**	**Notes**
Repeat indicator	not implemented	not implemented	
Reverse charging indication	not implemented	not implemented	
Segmented message	not implemented	optional	Used in optional segmentation procedures
Shift	not implemented	no IEs currently defined by ETSI that require the Shift IE	
Signal	implemented	not included in messages	Get ETSI T/S 46-32 and check
Transit delay selection and indication	not implemented	optional	
Transit network	length 6		
User-user	length 131	length network dependent 35 or 131	
Procedures			
5.1.1 Call request	Keypad IE can be used interchangeably with Called party number IE to send digits to the network	Keypad IE used only for supplementary service information	
5.1.1 Call request Sending complete indication	supports # and Sending complete IE	Mandatory to support Sending complete IE	
5.1.3 Overlap sending	Clarification on applying dial tone	Clarification on applying dial tone	
5.1.7 Call confirmation indication	Clarification on applying ringback tone	Clarification on applying ringback tone	
5.2.1 Incoming call	support of overlap receiving by terminals not required	network option	
5.2.3.1 SETUP delivered by point-to-point data link		Support of “no B-channel available” option mandatory	
5.3.4.3 Completion of clearing	Clarification of maintenance condition on point-to-multipoint configurations	Clarification of maintenance condition on point-to-multipoint configurations	
5.6.1 Call suspension	Fully implemented	some networks may support a maximum call identity value of two octets	
5.6.4 Call re-establishment	Implemented	some networks may not support use of the NOTIFY message	
5.9 User notification procedure	NOTIFY message may be sent in any call state	NOTIFY message may be sent in any call state	
5.10 Basic telecommunication service identification and selection	Not implemented	Not implemented	

	Spark	ETSI	Notes
5.11 Signalling procedures for bearer capability selection	Not implemented	Not implemented	
5.12 Signalling procedures for high layer compatibility selection	Not implemented	Not implemented	
6 see packet below			
7 UUS1 implicit	Implemented	Mandatory for network	
7 UUS1 explicit	Not implemented	Network option	
7 UUS2	Not implemented	Network option	
7 UUS3	Not implemented	Network option	
9 user timer T310	30-120 s	>40 s	
Annex D. Extension for symmetric call operation	Not applicable	Not applicable	
Annex E. Network specific facility selection	Not implemented		use not defined by ETSI
Annex F. D-channel backup procedures	Implemented	Not implemented	ETSI do not implement non-associated signalling
Message segmentation	Not implemented	Annex K	
Optional procedures for bearer service change	Not implemented	Not implemented	
Packet services			
Case A	Not implemented		
Case B on Basic rate	B and D channel	B and D channel	Optional
Case B on Primary rate	B channel	B and D channel	Optional
Notification classes on Basic rate	None, conditional, unconditional	None, conditional	
Notification classes on Primary rate	unconditional	None, conditional	
Semi-permanent connections to PH	No	Yes	
IE mapping of Called DTE address	Yes	Yes	
IE mapping of Called DTE address	Yes	Yes	
IE mapping of Calling DTE address	Yes	Yes	
IE mapping of end-to-end transit delay	Yes	Optional	
IE mapping of other information	No	Optional	

References

7.1 References for Part A

[1] PTC 131, "Spark ISDN user-network interface: Layer 1: Basic access."

[2] PTC 132, "Spark ISDN user-network interface: Layer 1: Primary Rate Access."

[3] TNA 133, "Spark ISDN user-network interface: Layer 2."

[4] ITU-T Recommendation G.701, "Vocabulary of digital transmission and multiplexing, and pulse code modulation (PCM) terms."

[5] ITU-T Recommendation I.112, "Vocabulary of terms for ISDNs."

[6] ITU-T Recommendation I.412, "ISDN user-network interfaces - interface structures and access capabilities.

[7] ITU-T Recommendation I.441 (Q.921), "ISDN user-network interface data link layer - specification."

[8] ITU-T Recommendation I.451 (Q.931), "ISDN user-network interface layer 3 specification."

[9] ITU-T Recommendation Q.932, "Generic procedures for the control of ISDN supplementary services."

7.2 References for Part B

[1] CCITT Recommendation *ISDN user-network interface layer 3 – General aspects*, Rec. Q.930/I.450.

[2] CCITT Recommendation *ISDN user-network interface – Interface structures and access capabilities*, Rec. I.412.

[3] CCITT Recommendation *ISDN user-network interface – Data link layer specification*, Rec. Q.921/I.441.

[4] CCITT Recommendation *Generic procedures for the control of ISDN supplementary services*, Rec. Q.932.

[5] CCITT Recommendation *Interface between data terminal equipment (DTE) and data circuit terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit*, Rec. X.25.

[6] CCITT Recommendation *Circuit mode bearer service categories*, Rec. I.231.

[7] CCITT Recommendation *Support of data terminal equipments (DTEs) with V-Series type interfaces by an integrated services digital network (ISDN)*, Rec. V.110.

[8] CCITT Recommendation *Support of X.21, X.21 bis and X.20 bis based data terminal equipments (DTEs) by an integrated services digital network (ISDN)*, Rec. X.30.

[9] CCITT Recommendation *Support by an ISDN of data terminal equipment with V-Series type interfaces with provision for statistical multiplexing*, Rec. V.120.

[10] CCITT Recommendation *Pulse code modulation (PCM) of voice frequencies*, Rec. G.711.

[11] CCITT Recommendation *32 kbit/s adaptive differential pulse code modulation (ADPCM)*, Rec. G.721.

[12] CCITT Recommendation *7 kHz audio coding within 64 kbit/s*, Rec. G.722.

[13] CCITT Recommendation *Codec for audiovisual services AT n ·384 kbit/s*, Rec. H.261.

[14] CCITT Recommendation *Support of packet mode terminal equipment by an ISDN*, Rec. X.31.

[15] CCITT Recommendation *Multiplexing rate adaption and support of existing interfaces*, Rec. I.460.

[16] CCITT Recommendation *Standardization of data signalling rates for synchronous data transmission on leased telephone-type circuits*, Rec. V.6.

[17] CCITT Recommendation *International user classes of service in public data networks and integrated services digital networks (ISDNs)*, Rec. X.1.

[18] *ISDN numbering and addressing principles*, Rec. I.330.

[19] *Numbering plan for the ISDN era*, Rec. E.164.

[20] CCITT Recommendation *Numbering plan for the international telephone service*, Rec. E.163.

[21] CCITT Recommendation *International numbering plan for public data networks*, Rec. X.121.

[22] CCITT Recommendation *Plan for telex destination codes*, Rec. F.69.

[23] CCITT Recommendation *Network service definition for Open Systems Interconnection (OSI) for CCITT applications*, Rec. X.213.

[24] ISO 8348:1987/Add.2:1988 *Information processing systems – Data communications – Network service definition – Addendum 2: Network layer addressing.*

[25] CCITT Recommendation *Principles relating ISDN numbers/subaddress to the OSI reference model network layer addresses*, Rec. I.334.

[26] CCITT Recommendation *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks*, Rec. X.21.

[27] CCITT Recommendation *Primary rate user-network interface – Layer 1 specification*, Rec. I.431.

[28] CCITT Recommendation *Control procedures for teletex and Group 4 facsimile services*, Rec. T.62.

[29] CCITT Recommendation *A document application profile for the interchange of Group 4 facsimile documents*, Rec. T.503.

[30] CCITT Recommendation *A document application profile MM for the interchange of formatted mixed mode documents*, Rec. T.501.

[31] CCITT Recommendation *Document application profile PM1 for the interchange of processable form documents*, Rec. T.502.

[32] CCITT Recommendation *Network-independent basic transport service for the telematic services*, Rec. T.70.

[33] CCITT Recommendation *Document application profile for videotex interworking*, Rec. T.504.

[34] CCITT Recommendation *Teleservices supported by an ISDN*, Rec. I.241.

[35] CCITT Recommendation *System aspects of the use of the 7 kHz audio codec within 64 kbit/s*, Rec. G.725.

[36] ISO 1745:1975 *Information processing – Basic mode control procedures for data communication systems.*

[37] CCITT Recommendation *Link access protocol balanced (LAPB) extended for half-duplex physical level facility*, Rec. T.71.

[38] ISO/IEC 4335:1991 *Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures – Elements of procedures.*

[39] ISO 8802-2:1989 *Information processing systems – Local area networks – Part 2: Logical link control.*

[40] CCITT Recommendation *Packet switched signalling system between public networks providing data transmission services*, Rec. X.75.

[41] ISO/IEC 8208:1990 *Information technology – Data communications – X.25 Packet layer Protocol for data terminal equipment.*

[42] ISO 8348:1987 *Information processing systems – Data communications – Network service definition.*

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[44] CCITT Recommendation *Procedure for the exchange of protocol identification during virtual call establishment on packet switched public data networks*, Rec. X.244.

[45] CCITT Recommendation *ISDN user-network interface data link layer – General aspects*, Rec. Q.920/I.440.

[46] CCITT Recommendation *Basic user-network interface – Layer 1 specification*, Rec. I.430.

[47] CCITT Recommendation *Definition of bearer service categories*, Rec. I.230.

[48] *Definition of teleservices*, Rec. I.240.

[49] *International Alphabet No. 5*, Rec. T.50.

[50] ISO 646 *Information processing – ISO 7-bit coded character set for information interchange*.

[51] CCITT Recommendations *on Integrated services digital network (ISDN).*

[52] CCITT Recommendation *Support of data terminal equipments (DTEs) with V-Series type interfaces by an integrated services digital network (ISDN)*, Rec. I.463.

[53] CCITT Recommendation, *Blue Book* Vol. VI, Rec. Q.931 (1988).

[54] CCITT Recommendation *Stage 3 description for additional information transfer supplementary services using DSS1*, Rec. Q.957.

[55] CCITT Recommendation *300 bits per second duplex modem standardized for use in the general switched telephone network*, Rec. V.21.

[56] CCITT Recommendation *1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits*, Rec. V.22.

[57] CCITT Recommendation *2400 bits per second duplex modem using frequency division technique standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits*, Rec. V.22 *bis.*

[58] CCITT Recommendation *600/1200-baud modem standardized for use in the general switched telephone network*, Rec. V.23.

[59] CCITT Recommendation *2400 bits per second modem standardized for use on 4-wire leased telephone-type circuits*, Rec. V.26.

[60] CCITT Recommendation *2400/1200 bits per second modem standardized for use in the general switched telephone network*, Rec. V.26 *bis*.

[61] CCITT Recommendation *2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone type circuits*, Rec. V.26 *ter*.

[62] CCITT Recommendation *4800 bits per second modem with manual equalizer standardized for use on leased telephone-type circuits*, Rec. V.27.

[63] CCITT Recommendation *4800/2400 bits per second modem with automatic equalizer standardized for use on leased telephone-type circuits*, Rec. V.27 *bis.*

[64] CCITT Recommendation *4800/2400 bits per second modem standardized for use in the general switched telephone network*, Rec. V.27 *ter.*

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[66] CCITT Recommendation *A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuits*, Rec. V.32.

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[68] CCITT Recommendation *Operational provisions for the international public facsimile service between subscribers stations with group 3 facsimile machines (telefax 3)*, Rec. F.182.

[69] CCITT Recommendation *Operational provisions for the international public facsimile service between subscribers stations with group 4 facsimile machines (telefax 4)*, Rec. F.184.

[70] CCITT Recommendation *Service requirements unique to mixed mode (MM) used within the teletex service*, Rec. F.230.

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[78] CCITT Recommendation *Open systems interconnection (OSI): Model and notation, service definition*, Recs. X.200-Series.

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[85] CCITT Recommendation *Stage 3 description for number identification supplementary services using DSS1*, Rec. Q.951.

[86] CCITT Recommendation *Stage 3 description for call offering supplementary service using DSS1*, Rec. Q.952.

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