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Health informatics — Interoperability of telehealth systems and networks —

Part 1: Introduction and definitions

Informatique de santé — Interopérabilité des systèmes et des réseaux de télésanté —

Partie 1: Introduction et définitions

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 16056-1 was prepared by Technical Committee ISO/TC 215, *Health informatics*.

ISO/TR 16056 consists of the following parts, under the general title *Health informatics — Interoperability of telehealth systems and networks*:

— *Part 1: Introduction and definitions*

— *Part 2: Real-time systems*

INTRODUCTION

Delivery of health care services by means of telehealth is advancing rapidly. Telehealth enables providing these services with the use of information and telecommunications technologies. This includes a broad spectrum of capabilities including acquisition, storage, presentation, and management of patient information (represented in different digital forms such as video, audio, or data), and communication of this information between care facilities with the use of communications links.

Telehealth interactions may be carried out in three ways: **real-time**, **store-and-forward** or with the use **media streaming** methods. While real-time interactions imply that all parties directly participate in the telehealth session, store-and-forward interactions involve sending, reviewing, and returning an opinion over a period of time. Streaming is a method of delivery real-time or stored data such as audio, video, documents, still images, or other data type across networks with a reasonable amount of Quality of Services (QoS). With streaming, a receiving system can start displaying (or playing) the data before the entire content arrives.

Real-time telehealth sessions usually involve **synchronous** data transmission while store-and-forward can usually be regarded as **asynchronous**. Streaming uses time-synchronized streams of continuous media during transmission. However, data presentation uses buffering, if the receiving system receives data more quickly than required. If the data is not received quickly enough, the presentation of the data is interrupted.

Interoperability of telehealth systems and networks is critical in ensuring the telehealth technology serves well the care recipients and providers and meets their expectations. While this requirement is essential to the long-term sustainability of telehealth, interoperability is difficult to achieve. There are many reasons that make telehealth interoperability difficult, however, the following three need urgent addressing: (1) too broad definition of telehealth, (2) lack of standards specifically designed for telehealth, and (3) collaboration between the information technology and telecommunications industries.

There are multiple definitions of telehealth. The services provided by telehealth cover a broad spectrum of activities ranging from videoconferencing through exchange of health information to providing care services in emergency and complex clinical cases. From a technology perspective, the scope of these services is too broad and this makes it difficult to develop telehealth standards and products.

There is no 'official' telehealth standard. The telehealth industry uses high-level health care guidelines and technical standards developed for various technology sectors including multimedia conferencing, information technology, data communications, and security. These guidelines and standards focus on functional and operational requirements and do not address interoperability. To further complicate the problem, all of these standards as well as the telehealth needs and practices are rapidly changing.

Telehealth, more than any other recent development, bridges the boundaries between telecommunications and information technologies. The business goals and attitudes of these two industries are different. Telecommunications industry has a history of regulation, standardization, and control of the customer premises equipment. Interoperability and reliability have been the key factors to growth. The information technology industry (the desktop computing industry in particular) has achieved success through encouraging innovation, diversity, and tremendous cost-efficiency not always paying attention to interoperability aspects of the technology. The marriage of these two cultures and the integration of their respective technologies proved to be challenging.

To address the needs for interoperable telehealth systems and networks, telehealth services must be clearly defined in terms of their scope and interrelationships with other health-related services, a set of telehealth-specific standards must be developed, and subsequently implemented by the respective industries.

This two-part ISO Technical Report addresses interoperability issues in telehealth systems and networks. This document has been structured as follows:

Part 1: Introduction and Definitions. Covers an introduction to telehealth and includes the definitions of telehealth, interoperability, and related terms.

Part 2: Real-Time Systems. Defines the scope of the technical standards related to real-time applications, (including video, audio, and data conferencing), identifies gaps and overlaps in the standards, defines requirements for interoperable telehealth systems and networks, and identifies building blocks for interoperable telehealth solutions.

This Technical Report is to be complemented by two other documents that will cover interoperability of store-and-forward and media streaming telehealth applications.

The target users of these documents are care providers and health care organizations, telehealth equipment vendors and implementers of telehealth solutions, professional organizations, and governments.

Health informatics — Interoperability of telehealth systems and networks — Part 1: Introduction and definitions

1 SCOPE

This Technical Report entitled *Interoperability of telehealth systems and networks - Part 1: Introduction and definitions* includes a brief introduction to interoperability of telehealth systems and networks, along with definitions of telehealth and related terms.

The scope of this document does not include the conformity and interoperability tests or functional specifications for telehealth systems and networks.

A more detailed description of issues concerning the interoperability of telehealth systems and networks capable of operating in real-time mode (including audio, video, and data conferencing) is included in *Part 2. Real-Time Systems*. That document identifies standards for real-time telehealth systems, examines interoperability aspects of telehealth applications, and defines interoperability requirements for telehealth systems and networks. Other documents will describe the issues surrounding interoperability of telehealth systems that use store-and-forward and media streaming technologies.

An informative annex describing the Telehealth Technical Reference Architecture has been also been included to describe more clearly the various components of a telehealth system and the elements that need to be addressed in formulating a set of requirements for these various components.

2 NORMATIVE REFERENCES

This Technical Report incorporates by dated or undated reference, provisions from other publications. These normative references are cited in the appropriate places in the text, and the publications are listed hereafter.

For dated references, subsequent amendments and revisions of any of these publications apply to this ISO Technical Report only when incorporated in it by amendment and revision. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TC 251/N99-097 (1999)	*Health Informatics - Interoperability of Healthcare Multimedia Report Systems. Final draft CEN Report*
ISO/IEC 17000:2004	*Conformity assessment – Vocabulary and general principles*
ITU-T Recommendation G.711 (1988)	*Pulse code modulation (PCM) of voice frequencies*.
ITU-T Recommendation G.722 (1993)	*7 KHz audio - coding within 64 kbit/s*.
ITU-T Recommendation G.728 (1992)	*Coding of speech at 16 kbit/s using low-delay code excited linear prediction.*
ITU-T Recommendation H.221 (1993)	*Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices*.
ITU-T Recommendation H.230 (1997)	*Frame-synchronous control and indication signals for audiovisual systems.*
ITU-T Recommendation H.242 (1996)	*System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s*.
ITU-T Recommendation H.243 (1997)	*Procedures for establishing communication between three or more audiovisual terminals using digital channels up to 1920 kbit/s*.

ITU-T Recommendation H.224 (1994)	*A real time control protocol for simplex applications using the H.221 LSD/HSD/HLP channels*.
ITU-T Recommendation H.281 (1994)	*A far end camera control protocol for videoconferences using H.224*.
ITU-T Recommendation H.233 (1996)	*Confidentiality System for Audiovisual Services.*
ITU-T Recommendation H.234 (1996)	*Encryption key management and authentication system for audiovisual services.*
ITU-T Recommendation H.320 (1996)	*Narrow-band visual telephone systems and terminal equipment*.
ITU-T Recommendation T.120 (1996)	*Data protocols for multimedia conferencing.*
ITU-T Recommendation T.121 (1996)	*Generic application template.*
ITU-T Recommendation T.122 (1993)	*Multipoint communication service for audiographics and audiovisual conferencing service definition.*
ITU-T Recommendation T.123 (1994)	*Protocol stacks for audiographic and audiovisual teleconference applications.*
ITU-T Recommendation T.124 (1995)	*Generic conference control.*
ITU-T Recommendation T.125 (1994)	*Multipoint communication service protocol specification.*
ITU-T Recommendation T.126 (1995)	*Multipoint still image and annotation protocol.*
ITU-T Recommendation T.127 (1995)	*Multipoint binary file transfer protocol.*

3 TERMS AND DEFINITIONS

For the purposes of this Technical Report, the following definitions apply.

3.1
accreditation
third party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks

3.2
A-law
variant of the G.711 audio encoding used primarily in North America and Japan

NOTE Related terms include μ-law and G.711

3.3
asynchronous transmission
transmission of individual bytes without time-dependency between the bytes

3.4
audiographics terminal
terminal that has audio and graphics capabilities, but no video capability

3.5
audiovisual terminal
terminal that has audio, video, and graphics capabilities

3.6
basic rate interface
BRI
ISDN service comprising two B (bearer) channels operating at 64 Kbps each and one D (data) channel operating at 16 Kbps

3.7
call
point-to-point multimedia communication between two H.32x endpoints

3.8
call setup
process of establishing a group of communication users and includes the initialization of any shared application and other resources which the user may require to be available

3.9
call signalling channel
reliable channel used to convey call setup messages following Q.931

3.10
call teardown
process of ending a call and freeing any resources reserved for that call

3.11
centralized multipoint conference
conference call in which all participating terminals communicate in a point-to-point fashion with an MCU

3.12
certification
third-party attestation related to products, processes, systems or persons

NOTE 1 Certification of a management system is sometimes also called registration.

NOTE 2 Certification is applicable to all objects of conformity assessment except for conformity assessment bodies themselves, to which accreditation is applicable.

3.13
channel service unit
CSU
interface used to connect a terminal or computer to a digital medium in the same way that a modem is used for connection to an analogue medium

3.14
charge coupled device
CCD
device used in cameras as an optical scanning mechanism.

NOTE It consists of a shift register that stores samples of analog signals. An analog charge is sequentially passed along the device by the action of stepping voltages and stored in potential wells formed under electrodes. The charge is moved from one well to another by the stepping voltages.

3.15
common intermediate format
CIF
ITU-T standard video picture scanning format where information is stored in luminance (brightness) and two color difference (chrominance) components

NOTE CIF represents 352 pixels/line by 288 lines/image for luminance and 176 pixels/line by 144 lines/image for chrominance. See also QCIF.

3.16
codec
device used to covert analog signals into digital (and vice versa), and perform encoding / decoding and compression / decompression of the digital data

3.17
composite video
type of video signal in which all information -- the red, blue, and green signals, and sometimes audio signals as well, are mixed together

NOTE Composite video is used by NTSC-compliant devices (see NTSC Standard).

3.18
conformity assessment
demonstration that specified requirements relating to a product, process, system, person or body are fulfilled

NOTE Conformity to a set of specifications is a prerequisite to interoperability. However, conformity to the specifications alone does not guarantee interoperability of systems.

3.19
data service unit
DSU
device used in digital transmission for connecting a CSU to data terminal equipment (a terminal or computer), in the same way that a modem is used for connection to an analogue medium

Note See also CSU.

3.20
decentralized multipoint conference
conference in which the participating terminals multicast to all other participating terminals without an MCU

3.21
endpoint
terminal, gateway, or MCU

3.22
G.711
ITU-T recommendation for the digital representation of speech up to 3.4 KHz of frequency producing a 64 Kbps data stream

NOTE Commonly used in telephone networks. It comes in two variants: A-law and μ-law.

3.23
G.722
ITU-T recommendation for the digital representation of audio up to 7 KHz of frequency producing a 64 Kbps data stream with a much higher quality than G.711

3.24
G.728
ITU-T recommendation for the digital representation of audio producing a 16 Kbps data stream producing near-telephone quality audio.

3.25
gatekeeper
H.323 entity that provides address translation, control access, and sometimes bandwidth management to the LAN for H.323 terminals, gateways, and MCUs

3.26
gateway
H.323 entity, which provides real-time, two-way communications between H.323 terminals on the LAN and other ITU terminals on a WAN, or to another H.323 gateway

3.27
generic conference call
GCC
set of conference services described in the ITU-T T.124 Recommendation

3.28
H.221
ITU-T recommendation defining how to multiplex video and audio into frames using 64-1920 Kbps channels for switched and leased network services, excluding packetized networks

3.29
H.225D
ITU-T recommendation that specifies messages for call control including signaling, registration and admissions, and packetization/synchronization of media systems

3.30
H.230
ITU-T recommendation that specifies the frame-synchronous control and indication signals for audiovisual systems

3.31
H.231
ITU-T recommendation that specifies the multipoint control unit

3.32
H.235
ITU-T recommendation that defines the security framework used to provide authentication, encryption, and integrity for H.323 systems

3.33
H.242
ITU-T recommendation that specifies how to establish the communication between audiovisual terminals using digital channels with speeds up to 2 Mbps

3.34
H.243
ITU-T recommendation that specifies the establishment of communication between three or more audiovisual terminals using digital channels with speeds up to 2 Mbps

3.35
H.245
ITU-T recommendation that specifies messages for opening and closing channels for media streams, and other commends, requests and indications between two H.323 endpoints

3.36
H.261
ITU-T recommendation that specifies the video encoding and compression algorithm for two video resolutions: 352 x 288 CIF and 176 x 144 QCIF

NOTE H.261 is used in both H.320 and T.120.

3.37
H.263
ITU-T recommendation that specifies a new video codec for video over packet-switched networks or POTS

NOTE H.263 optimizes H.261 for very low bit rate of video coding below 64 Kbps. H.263 provides better motion compensation, more accurate motion vectors, optimized quantization for very low bit rates, and arithmetic coding.