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Recommendation

ITU-T F.780.3 (12/2022)

SERIES F: Non-telephone telecommunication services

Multimedia services

Use cases and requirements for ultra-high-definition teleconsulting system

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Recommendation ITU-T F.780.3

Use cases and requirements for ultra-high-definition teleconsulting system

Summary

Recommendation ITU-T F.780.3 describes the use cases and technical requirements of an ultra-high-definition (UHD) teleconsulting system. UHD teleconsulting system is an important application of UHD display technology and the information and communication technology (ICT) in the medical field, under the background of unbalanced medical resources, especially during the COVID-19 pandemic, which can realize the optimal allocation of medical resources and benefit people in areas with less developed medical resources.

It recommends the framework, functional requirements, and performance requirements of a UHD teleconsulting system which are the necessary hardware and software foundations for teleconsultation.

Finally, the Recommendation also provides two application cases of the UHD teleconsulting system in Appendix I, including the roles of different participants, as well as the teleconsultation process.

This Recommendation is suitable for the development, construction, and evaluation of the UHD teleconsulting system in different countries and regions.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Framework, performance requirement, teleconsulting, UHD, use cases.

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FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Use cases and requirements for ultra-high-definition teleconsulting system

1 Scope

This Recommendation specifies the use cases and requirements for the ultra-high definition (UHD) teleconsulting system, which includes:

– framework for UHD teleconsulting system;

– function requirements for UHD teleconsulting system; and

– performance requirements for UHD teleconsulting system.

For the implementation of this Recommendation, two application use-cases are given in Appendix I, scheduled teleconsultation and emergency treatment teleconsultation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T K.116] Recommendation ITU-T K.116 (2019), *Electromagnetic compatibility requirements and test methods for radio telecommunication terminal equipment.*

[ISO/IEC 27002] ISO/IEC 27002:2022, *Information security, cybersecurity and privacy protection – Information security controls.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 code rate [b-ISO/IEC 23008-10]: Ratio between the number of source symbols and the number of encoding symbols.

3.1.2 colour gamut [b-IEC 60050-845]: Volume, area, or solid in a colour space, consisting of all those colours that are either:

– Present in a specific scene, artwork, photograph, photomechanical, or other reproduction; or

– Capable of being created using a particular output device and/or medium.

NOTE – In reproduction and media applications only the volume or solid in a colour space is regarded as a colour gamut. In applications such as signal lighting the colour gamut is an area.

3.1.3 echo cancellation [b-IEC 60050-704]: A method of echo control effected by subtracting an estimated echo from the signal which includes an unwanted echo.

3.1.4 electromagnetic compatibility [b-ITU-T K.127]: Ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

3.1.5 luminance [b-IEC 60050-841]: Density of luminous intensity with respect to the projected area in a specified direction at a specified point on a real or imaginary surface.

3.1.6 luminance contrast [b-IEC 60050-845]: Quotient of the luminance of two active parts of a display surface having the same or different colours.

NOTE – The luminance contrast ratio has unit one.

3.1.7 luminance uniformity [b-IEC 60050-845]: Quotient of minimum luminance and average luminance of a surface.

NOTE – The luminance uniformity has unit one.

3.1.8 picture sticking [b-IEC 60050-531]: An unwanted image reappearing after the apparent removal of the charge corresponding to a previously stationary image.

3.1.9 reverberation time [b-ISO 354:2003]: Time, in seconds, that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped.

3.1.10 sampling rate [b-ISO 21250-3]: <signal processing> Frequency with which a continuous signal is sampled and converted into a time-discrete signal.

NOTE – The unit is hertz (Hz) or samples (readings) per second [samples per second (samples/s)].

3.1.11 signal-to-noise ratio (SNR) [b-IEC/TR 80001-2-3]: Comparison of signal power to noise power.

3.1.12 ultra-high definition [b-ITU-T F.780.1]: A video format of digital display and camera in which the horizontal screen resolution is on the order of over 4 000 pixels.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 backend business system: A system for controlling and processing the data related to the UHD teleconsulting service.

3.2.2 demander: A doctor or nurse who wants to consult with other doctors through a UHD teleconsulting system.

3.2.3 mobile control terminal: A portable control equipment for controlling the behaviour of the teleconsulting terminal system.

3.2.4 teleconsulting: A consultation method between doctors or between doctors and nurses through telephone, fax, network video, and other modern communication tools, to complete the analysis of medical records, disease diagnosis, and to further determine the treatment plan.

3.2.5 teleconsulting terminal system: A terminal system for displaying, capturing and real-time pushing messages of the UHD streaming media.

3.2.6 UHD streaming media: A technology and process providing UHD definition video and high-fidelity audio audio-visual services, by compressing a series of UHD video data and high fidelity audio data, and transmitting the data packets in real time in streaming mode.

3.2.7 UHD streaming media service system: A system for providing processing and transmission of UHD streaming media data generated by the UHD teleconsulting service.

3.2.8 ultra-high definition teleconsulting system: A system for realizing complete teleconsulting service based on the UHD streaming media technology.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

BBS Backend Business System

EMR	Electronic Medical Record
HIS	Hospital Information System
ICT	Information and Communication Technology
LAN	Local Area Network
MCT	Mobile Control Terminal
MMS	Microsoft Media Server Protocol
MQTT	Message Queuing Telemetry Transport
RTP	Real-time Transport Protocol
RTCP	Real-time Transport Control Protocol
RTMP	Real-time Messaging Protocol
RTSP	Real-time Streaming Protocol
SNR	Signal-to-Noise Ratio
TCTS	Teleconsulting Terminal System
UHD	Ultra-High Definition
UHDSM	Ultra-High-Definition Streaming Media
UHDTCS	Ultra-High-Definition Teleconsulting System
WAN	Wide Area Network

5 Conventions

None.

6 Introduction

Teleconsulting is the convergence of modern medicine and the information and communication technology (ICT). It is a healthcare consultation carried out remotely using audio-visual telecommunications between doctors or between doctors and nurses. Teleconsulting system will realize face-to-face medical communication between doctors or between doctors and nurses in two or more places, furthermore, it will also realize the optimal allocation of medical resources.

According to the World Health Organization (WHO), telemedicine is "the use of information and communication technology to deliver medical services and information from one location to another", while e-health is "a new term used to describe the combined use of electronic information and communication technology in the health sector". As a subcategory of e-health, teleconsulting which can reassign medical resources is going to be indispensable in the health care area and medical community, especially in developing countries. It is important to achieve interoperability amongst systems and to reduce the cost of devices through economies of scale. Consequently, the development of global international standards with the involvement of the major plays (i.e., governments, inter-governmental organizations, non-governmental organizations, medical institutions, doctors, manufacturers, etc.) is a key factor in achieving these objectives.

Teleconsulting systems are supposed to be widely deployed in the coming future, especially in developing countries. Furthermore, the ultra-high-definition teleconsulting systems (UHDTCSs) meet the needs of local and remote consultation. The main object of this Recommendation is to standardize the use cases and requirements of the UHDTCS at the beginning of the worldwide technical promotion and initialize the basic requirements preliminarily as the guideline for the spread, especially in developing countries.

7 Framework for UHDTCS

7.1 Summary

The technical requirement of UHDTCS specifies the overall system framework and communication framework for streaming the media service system, to maintain the conception model consistency of UHDTCS in the process of designing, development and application.

7.2 Overall system framework

UHDTCS should include the teleconsulting terminal system (TCTS), ultra-high-definition streaming media (UHDSM) service system, backend business system (BBS), mobile control terminal (MCT) and gateway as shown in Figure 1.

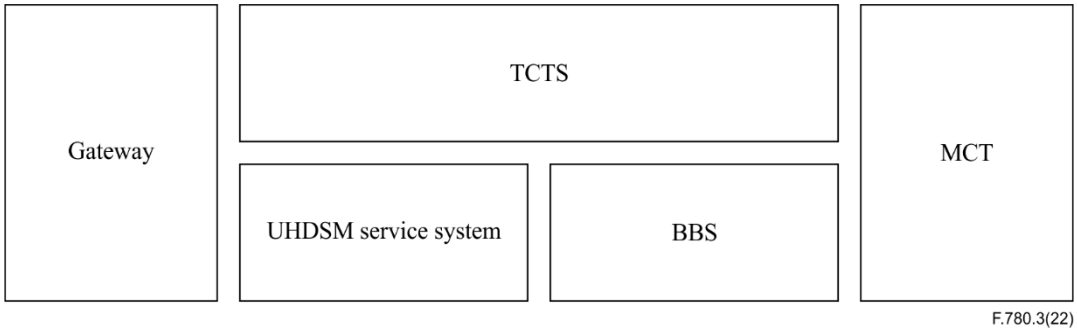

Figure 1 – Overall system framework for UHDTCS

Each part of the system is briefly introduced as follows:

a) TCTS: It consists of at least a ultra-high definition (UHD) camera/display equipment, high quality audio record/display equipment, real time message display equipment, and a UHDSM distribution equipment which can support interoperation, relative business functions, and equipment management functions of TCTS;

b) UHDSM service system: It provides essential streaming media service support to UHDTCS, which includes the bidirectional transmission of the UHDSM data;

c) BBS: It should consist of a hospital business management, equipment management, consultation task management, and provide services such as doctor resource management, equipment information and status management, consultation statistics and clinic appointment to the UHDTCS;

d) MCT: It provides the controlling function support to the TCTS, BBS, and UHDSM service system. It should control the business and equipment of the UHD teleconsulting, ensuring that each part of the UHDTCS completes the consultation process co-ordinately, simply, efficiently and intelligently;

e) Gateway: It runs through the other parts of the UHDTCS, and should consist of a switch, router and a 4G / 5G wireless equipment, providing essential hardware support to the network connection of the UHD teleconsulting.

7.3 Communication framework for streaming media service system

The communication framework for streaming media service system consists of four subsystems, which are TCTS, BBS, MCT, and UHDSM service system. The functions of each subsystem are as follows:

a) TCTS: to provide collection, codec, and display/play of a UHD video and high definition audio, as well as the streaming media service of an uplink / downlink transmission with the UHDSM service system;

b) BBS: to provide registration, store consultation task information, and create streaming media virtual consultation room;

c) MCT: to show and enter consultation task, initiate and make the connection of the UHD teleconsulting;

d) UHDSM service system: to provide uplink / downlink and transmission of a UHDSM live broadcast and realise the seamless connection of the streaming media service.

The four subsystems can realise the construction and operation of the UHDTCS through eight processes shown in Figure 2.

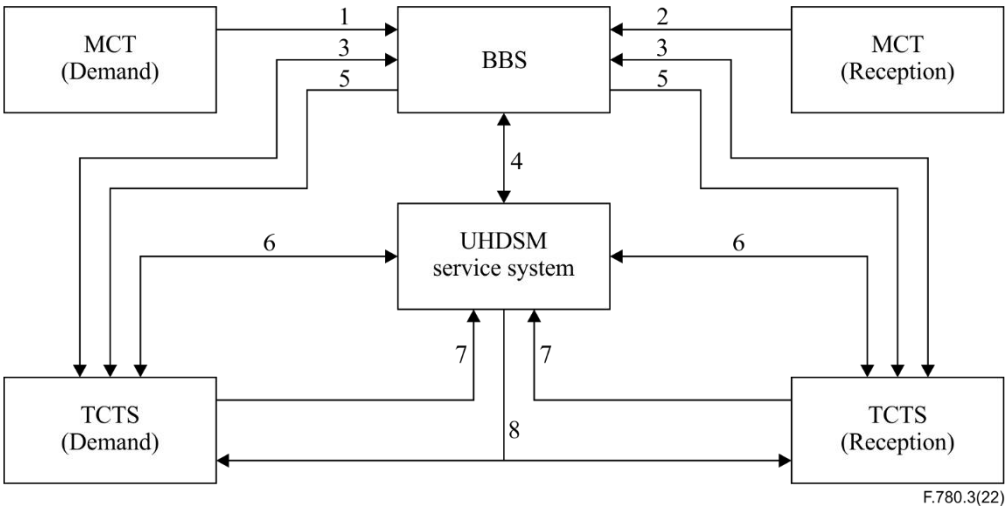

Figure 2 – Framework for system communication logic

As shown in Figure 2, the process number indicates the business sequence during the communication framework, and the same number indicates the simultaneous business. The detailed businesses of each process are as follows:

a) Process 1: The demand side initiates a UHD teleconsulting request to BBS by MCT;

b) Process 2: The reception side returns the treatment result to BBS by MCT;

c) Process 3: Communications have been established between TCTS and BBS for both the demand side and the reception side;

d) Process 4: Communication has been established between BBS and the UHDSM service system;

e) Process 5: BBS distributes information of the allocated UHDSM service system to TCTSs of both the demand and the reception side;

f) Process 6: Communications have been established between TCTS and the UHDSM service system for both the demand side and the reception side;

g) Process 7: TCTSs of the demand side and the reception side send the UHDSM data to the UHDSM service system;

h) Process 8: UHDSM service system provides UHDSM data to TCTSs of the demand side and reception side.

8 Function requirements for UHDTCS

8.1 Summary

This Recommendation specifies the functions of the UHDTCS from the following five aspects: BBS, UHDSM service system, TCTS, MCT and gateway.

8.2 BBS

8.2.1 Hospital business management

To ensure the efficient inquiry and effective management of the hospital information about the UHD teleconsulting business, the hospital business management of the backend business system (BBS) should include the following functions:

a) To create, edit, delete, distribute, record and inquire about the information of the hospital, department, consultation room, equipment and the doctors;

b) To create the management mechanism of the roles and the authorities;

c) To arrange and show the reception time, period (monthly or weekly), fees, patient residual number, and open the consultation appointment (such as emergency treatment, teleconsulting, etc.);

d) To register, edit, delete, and store the patient information (support both new creation and import from the hospital information system (HIS) system);

e) To accept / refuse the consultation task, initiate / end the operation, and record the diagnosis suggestion for the patients;

f) The consultation task information includes but is not limited to consultation time, doctor information, consultation content, contact methods of both sides, consultation status, patient information (name, age, sex, disease history, etc.), and doctor application;

g) To count, maintain and manage the gradual relevant number of hospitals, departments, consultation rooms and doctors;

h) To record, show, and print the electronic medical record (EMR) (handwritten or scanned), edit the consultation report, and store the EMR information on the cloud server.

8.2.2 Equipment management

To monitor and manage the UHDTCS equipment in a unified way, the equipment management of BBS should include the following functions:

a) To register and authorise the equipment of UHDTCS;

b) To edit and delete the authorised equipment information;

c) To monitor the authorised equipment status.

8.2.3 Teleconsulting task management

8.2.3.1 Management of teleconsulting appointment

To ensure the efficiency, reasonability and operability of the consultation appointment management service. The management of the teleconsulting appointments of the BBS should include the following functions:

a) To support appointment initiation of point-to-point teleconsulting task;

b) To show the consultation task to be responded to by a relative director, who can add, delete, revise, respond, remark, transmit, hang up and trace the consultation task;

c) To trace the participated and initiated task information, including but not limited to consultation participant, time and results (besides the relevant information of the diagnosis);

d) Higher level doctors or managers can overrule the operation by management service according to the consultation reality, and require a lower doctor to supplement the relative material;

e) Higher level doctors or managers can require third party doctors by management service according to the patient's reality, and feedback the coordinated time and place to the service originator;

f) To support consultation fee settlement, online payment is more suitable.

8.2.3.2 Management of the teleconsulting process and files

To ensure the efficiency, reasonability and operability of the management of the consultation process and the relative files, the management of the consultation process and files of the BBS should include the following functions:

a) To inquire, edit and delete the consultation record;

b) To support ordinary teleconsulting mode and emergence teleconsulting mode. Only the former should be limited by a doctor appointment arrangement and a patient residual number;

c) To support the teleconsulting platform to manage the hospital authority in a unified way, including but not limited to hospital reception qualification, doctor arrangement situation, inquiry of patient medical record, consultation procedure initiation, and other account authority;

d) The upper / lower-level hospital can decide whether to use video function or not depending on the reality of the patient;

e) To connect to the UHDSM service, and support the monitoring and management of the local / cloud service room;

f) To support the data statistics overview of teleconsulting service usage, offer the statistics report service from the dimensions of the doctor's arrangement, consultation task, and equipment usage.

8.3 UHDSM service system

To ensure to offer a stable, efficient, and high-quality streaming media service to the UHDTCS, the UHDSM service system should include the following functions:

a) To codec and transmit the UHD video and high-quality audio;

b) To ensure the bidirectional transmission of the UHD video and high-quality audio between the service system and the TCTS;

c) To monitor the logic and transmission of a live broadcast of both UHDSM and the virtual consultation room;

d) To monitor the user status of UHDTCS and the transmission reliability of the UHDSM.

8.4 TCTS

To ensure the operability and support of the UHDSM multimedia display, the teleconsulting terminal system (TCTS) should include the following functions:

a) To have a highly efficient and high quality codec, uplink and downlink bidirectionally transmit, multichannel UHDSM display, UHDSM recorded by a multichannel UHD camera and a high quality audio recorder;

b) The equipment can be registered, recognised by MCT, and can accept the operation instructions sent by the MCT;

c) To display UHDSM and a high-quality audio, switch and split display UHD video;

d) To support ordinary maintenance operations such as software upload and debugging;

e) The equipment information can be registered into BBS;

f) To monitor the usage status of the equipment in the terminal system;

g) To prompt the network disconnection and monitor the network recovery.

8.5 MCT

To provide a convenient, efficient and stable control operation, the mobile control terminal (MCT) system should include the following functions:

a) To support log in with an account and password;

b) To support auto start control application, display consultation form interface after login, inquire and display the task card, calendar, and task status (such as not started, in process, ended and expired);

c) To configure relative parameters through the control application interface, the parameters include but are not limited to the IP address of the MCT, mobile control icon and server IP address of the UHD remote control system;

d) To operate the system on an information level, the operations include but are not limited to equipment registration, information editing, usage authority distribution, upgrading and maintenance, daily record traceability and parameter setting;

e) To initiate real time response instruction, monitor relative business information, and mark undone tasks every day;

f) To support control application auto renew and upgrading;

g) To inquire about the detail of the to-be-consulted list, which include but is not limited to consultation time, doctor, report the status of terminal and content;

h) To control the consultation process which include but is not limited to the initiation, ending, acceptance and push of the consultation video;

i) To control accessory equipment and their functions of TCTS, which include but is not limited to volume adjustment, the video window and video source shift;

j) To support the sequence arrangement of the doctor and consultation room;

k) To support the disease description of the patient and display of the case result;

l) When connections have been established among many TCTS in the same consultation task, each system can control the camera focal distance and veer off the others by the corresponding MCT;

m) To share the UHD video and high-quality audio recorded by any TCTS with the other TCTSs in the same consultation task by the corresponding MCT;

n) To push the case, patient test information and pictures of other TCTS to corresponding TCTS one key;

o) Gesture control is encouraged in the MCT to adjust the luminance, size, zooming, shift and erasure.

8.6 Gateway

The gateway should control the data transmission authority of the UHDSM and other businesses as well as the access authority of all the connections in the UHDTCS.

9 Performance requirements for UHDTCS

9.1 General

The performance requirements for UHDTCS will be regulated on five aspects: BBS, UHDSM service system, TCTS, MCT and gateway.

9.2 BBS

The backend business system (BBS) shall ensure the following performance requirements:

a) Support 24-hour stable and reliable operation;

b) Stably support the concurrent amount of teleconsultation business of no less than 100 orders of magnitude.

9.3 UHDSM service system

The UHDSM service system shall ensure the following performance requirements:

a) Support 24-hour stable and reliable operation;

b) Stably support the concurrent amount of teleconsultation business of no less than 100 orders of magnitude;

c) Support different streaming media protocols, including but not limited to Microsoft media server protocol (MMS), real-time transport protocol (RTP) / real-time streaming protocol (RTSP), real-time messaging protocol (RTMP);

d) The delay of the UHDSM service provided in the network environment shall be guaranteed to be a millisecond. The UHDSM service can transmit UHDSM with high quality and efficiency according to the specifications of the ultra-high-definition video and high-definition audio specified in clauses 9.4.4 and 9.4.5;

e) Support multi-channel and multi-party simultaneous UHD teleconsultation business.

9.4 Teleconsulting terminal system

9.4.1 UHD video display equipment

9.4.1.1 Work and storage environment

To ensure the normal work and good storage of the UHD video display equipment, the corresponding environmental requirements given in Table 1 shall be met.

Table 1 – The work and storage environment requirements

No.	Parameters	Specifications	Units	Notes
1	Working temperature	5 ~ 35	Celsius	–
2	Working relative humidity	10% ~ 90%	–	Noncondensing
3	Maximum humidity gradient	10	Percent per hour	–
4	Storage temperature	–20 ~ 60	Celsius	–
5	Storage relative humidity	10% ~ 90%	–	Noncondensing
6	Working altitude	–16 ~ 3 048	Metre	–
7	Storage altitude	–16 ~ 10 600	Metre	–
8	Loadability margin	7 × 24	Hour per week	–

9.4.1.2 Battery and efficiency

To ensure normal operation and power consumption control, the requirements of the battery given in Table 2 shall be met.

Table 2 – The battery requirements of the UHD video display equipment

No.	Parameters	Specifications	Units
1	Voltage	AC 96 ~ 264	Volt
2	Frequency	50/60	Hertz
3	Working power	220 ~ 380	Watt
4	Standby power	≤ 0.8	Watt
5	Transfer efficiency	≥ 83%	–

9.4.1.3 Electromagnetic compatibility

To ensure that the UHD video display equipment can operate safely in the complex electromagnetic environment, the electromagnetic compatibility test results of the UHD video display equipment should comply with the requirements of [ITU-T K.116].

9.4.1.4 UHD display

To meet the display demand of a large amount of data for the consultation terminal system during the process of the teleconsulting business, the display device can frequently split screens and change screens stably and reliably for a long time.

To ensure that the UHD video display equipment can display the consultation video / image content with high quality and ultra-high definition, the display performance requirements given in Table 3 should be met.

Table 3 – Performance requirements of a photoelectric display for UHD display equipment

No.	Parameters	Specifications	Units
1	Resolution	≥ 3 840 × 2 160	Pixel
2	Luminance	≥ 340	cd/m^2
3	Contrast ratio	≥ 800:1	–
4	Luminance uniformity	≥ 75%	–
5	Colour gamut	≥ 72%	–
6	Response time	≤ 12	ms
7	Viewing angle range	H : ≥ 178 V : ≥ 178	Degree
8	White chromaticity uniformity	≤ 0.01	–
9	Bright picture sticking	≤ 1	–
10	Dark picture sticking	≤ 1	–
11	Darkroom contrast ratio	≥ 3 000:1	–
12	Light leakage	≤ 0.5	cd/m^2
13	Display format	Conform	–
14	Dark field uniformity	≥ 70%	–

9.4.1.5 UHD video acquisition equipment

To ensure the quality of the video acquired by the consultation terminal system, the UHD acquisition equipment of the system should meet the following requirements.

Table 4 – The core performance requirements

No.	Parameters		Specifications	Units	Notes
1	Resolution		≥ 3 840 × 2 160	Pixel	
2	Horizontal translation range		±90	Degree	Power-driven
3	Vertical translation range		–30 ~ +30	Degree	
4	Zoom		≥ 12	Times	
5	Zoom view	Diagonal	≥ 90	Degree	
6		Horizontal	≥ 80	Degree	
7		Vertical	≥ 50	Degree	

In addition to the performance requirements in the table above, the camera shall be compatible with the mainstream video conference, recording and broadcast applications.

In order to facilitate the real-time control of the UHD video acquisition equipment, the equipment shall support to be controlled remotely by the mobile control terminal.

9.4.2 High fidelity audio acquisition equipment

9.4.2.1 Working environment

To ensure the normal work and good storage of the high fidelity audio acquisition equipment, the corresponding environmental requirements in the following table shall be met.

Table 5 – The work and storage environment requirements

No.	Parameters	Specifications	Units	Notes
1	Working temperature	5 ~ 40	Celsius	
2	Working relative humidity	20% ~ 85%	–	Noncondensing
3	Noise level	< 48	dB	
4	Storage temperature	–10 ~ 40	Celsius	
5	Reverberation time	< 0.5	Second	

9.4.2.2 Acquisition performance

To ensure the high fidelity and convenience of teleconsulting voice collection, the audio acquisition equipment shall guarantee that there are no obvious volume and quality drops in the audio collected in any direction within a radius of three metres and shall support intelligent dynamic noise cancelling technology. Gesture-controlled audio capture switches shall also be supported.

High-fidelity audio acquisition equipment in UHDTCS should meet the performance requirements given in Table 6.

Table 6 – Performance requirements for high-fidelity audio acquisition equipment

No.	Parameters	Specifications	Units
1	Up-sampling rate	≥ 32	kHz/s
2	Down-sampling rate	≥ 48	kHz/s
3	Direction of audio acquisition	All	–
4	Audio bandwidth	20 ~ 16 000	Hz
5	Sensitivity of audio acquisition	≤ –30	dB
6	Signal-to-noise ratio (SNR)	≥ 60	dB
7	Echo cancellation	< 390	ms
8	Quantization accuracy	≥ 16	bit
9	Sound channel number	2	–
10	Code rate	≥ 70	kbit/s

9.4.3 UHD streaming media distribution equipment

To ensure the high-quality display of the collected UHDSM on multiple TCTS, the performance requirements given in Table 7 should be met.

Table 7 – The core performance requirements of UHDSM distribution equipment

No.	Parameters	Specifications	Units	Note
1	Input resolution	≥ 3 840 × 2 160	Pixel	
2	Recording resolution	≥ 3 840 × 2 160	Pixel	
3	Output resolution	≥ 3 840 × 2 160	Pixel	
4	Recording format	Equal to or better than the existing mainstream recording formats.		
5	Frame rate of recording	≥ 30		The resolution shall meet Article 2 of the table.
6	Frame rate of output	≥ 60		The resolution shall meet Article 3 of the table.

9.4.4 UHD video encoding/decoding

The performance of the codec scheme adopted by the UHD video shall be equal to or better than the existing mainstream UHD video codec technology.

9.4.5 High fidelity audio encoding/decoding

The performance of the codec scheme adopted by the microphone and the audio player shall be equal to or better than the existing mainstream high fidelity audio codec technology.

9.4.6 Acquisition and transmission of UHD video and high fidelity audio

9.4.6.1 UHD video and high-fidelity audio acquisition

The performance requirements of the UHD video acquisition shall not be less than:

a) Resolution rate: 3 840 × 2 160 pixels.

b) Frame rate: 25 frames/s, 30 frames/s is recommended.

c) Code rate: 15 Mbit/s.

If the acquisition setting of high-definition audio acquisition equipment is adjustable, the acquisition should be carried out under the optimal setting.

9.4.6.2 UHD video and high fidelity audio transmission

It shall support the bidirectional real-time transmission of the UHDSM in the network environment and support the network jitter control.

The audio of the TCTS shall be guaranteed to be high quality and high fidelity, and the audio code rate shall not be less than 15 Mbit/s.

9.4.7 Streaming media transmission protocol

It shall support the protocols including but not limited to MMS, RTP/RTSP, real-time transport control protocol (RTCP), and RTMP.

It shall be consistent with the communication protocol of the streaming media server and real-time UHD multi-media cloud.

9.5 MCT

The screen size of the mobile control terminal (MCT) should not be less than 10 inches and the screen resolution should not be less than 1 920 × 1 080 pixels.

The control application of the MCT shall aim to be the control software for the TCTS. The operation response speed shall be at a millisecond level and it shall guarantee that the users have no obvious feeling of stagnation.

9.6 Gateway

9.6.1 Working environment

To ensure the normal operation of gateway equipment, the corresponding environmental requirements given in Table 8 shall be met.

Table 8 – The work and storage environment requirements

No.	Parameters	Specifications	Units	Notes
1	Working temperature	0 ~ 40	Celsius	
2	Working relative humidity	10% ~ 90%		Noncondensing
3	Storage temperature	–40 ~ 70	11 111	

9.6.2 Performance requirements

The gateway shall support all types of gigabit network equipment, gigabit network interfaces and data transmission protocols.

The gateway shall ensure that the wireless speed is no less than one gigabit. It shall have a gigabit WAN interface, wide area network (WAN) / local area network (LAN) variable interfaces and LAN interfaces.

9.7 Security requirements

9.7.1 General

To ensure the security of communication and data transmission in the UHDTCS, it will be regulated from four aspects: login management, transmission security, data security and key management.

9.7.2 Login management

The requirements of login management shall comply with the requirements of [ISO/IEC 27002], including but not limited to user registration, user privilege management, user password management, password use, equipment login verification and network service access.

9.7.3 Transmission security

The protocol and process of data transmission security shall comply with the requirements of [ISO/IEC 27002].

9.7.4 Data security

In addition to patient data (including but not limited to user information, consultation purpose, consultation plan, etc.), the data generated during teleconsultation shall be encrypted and stored in the TCTS.

Control measures and implementation of data encryption shall comply with the requirements of [ISO/IEC 27002].

9.7.5 Key management

The requirements of key management shall comply with the requirements of [ISO/IEC 27002].

Appendix I

Use cases for UHDTCS

(This appendix does not form an integral part of this Recommendation.)

This Recommendation can support two use cases of teleconsultation, which are scheduled teleconsultation and emergency treatment teleconsultation.

I.1 Use case 1: Scheduled teleconsultation

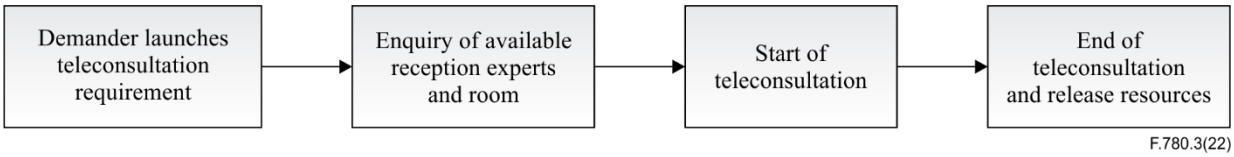

Figure I.1 – Process of scheduled teleconsultation

As shown in Figure I.1, the process of a scheduled teleconsultation consists of four steps, in turn, each step and its requirements are as follows:

1) The demander (e.g., medical doctor) launches a teleconsultation application. Before launching the teleconsultation, the demander shall confirm the available teleconsulting room of the hospital, the exact time of the teleconsultation, the conditions of the required equipment, department, and the number of the reception experts.
2) UHDTCS searches the relevant experts (e.g., other doctors) according to the requirement. The hospital providing the teleconsultation shall update the available time of reception experts and the information on unoccupied consultation rooms in the UHDTCS in time.
3) Teleconsultation starts.
4) Release the teleconsulting resources at the end of the teleconsultation, such as room status and the available experts.

I.2 Use case 2: Emergency treatment teleconsultation

The process and requirements of emergency treatment teleconsultation are similar to those of a scheduled teleconsultation, if the emergency treatment teleconsultation is in real time, the UHDTCS shall support the sending of temporary invitations to all the experts of the target departments.

A temporary invitation is a message that is sent to the relevant experts by the system before the emergency treatment teleconsultation, e.g., a message informs the experts that the teleconsultation will start in a short time. Idle experts can directly participate in the consultation.

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