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OF ITU

SERIES X: DATA NETWORKS, OPEN SYSTEM COMMUNICATIONS AND SECURITY

Information and network security – Telebiometrics

e-Health and world-wide telemedicines – Generic telecommunication protocol

Recommendation ITU-T X.1080.1

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Recommendation ITU-T X.1080.1

e-Health and world-wide telemedicines – Generic telecommunication protocol

Summary

Recommendation ITU-T X.1080.1 defines the framework for other parts of the ITU-T 1080.x series of Recommendations by providing the overall model for communications aspects of telebiometrics. It provides the basic allocation of object identifiers for uniquely identifying pieces of information during data transfer and it defines a generic telecommunication protocol.

It provides a technique for a formal specification of objects and it specifies a generic protocol that supports interactions between a medical station local to a patient and a remote medical centre providing greater expertise. This protocol is to be used and extended by other parts of the ITU-T X.1080.x series Recommendations.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T X.1080.1	2011-10-14	17	11.1002/1000/11384
2.0	ITU-T X.1080.1	2018-05-14	17	11.1002/1000/13604

Keywords

e-Health, protocol, telebiometrics, telemedicines.

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* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization 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.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Introduction

This Recommendation makes available, by the use of information and communication technology (ICT), medical expertise and diagnostic, and remedial techniques that are currently primarily available in one country or in urban areas of a country to other countries or rural areas of another country on an equal and global basis.

It includes things that are often called "traditional medicine/remedies" and things that are often called "alternative medicine/remedies".

There are two aspects of this work. This part defines a set of messages, with authentication, integrity, and confidentiality (specified using ASN.1) that provide the telebiometrics communications between an operator and a remote telemedicine device (a biometric processing unit (BPU)). The other is the adequate instances taken from the tables of quantities and units that need to be transmitted in support of the communication. These are related to both measurement (out modalities) and interaction with (in modalities) the human body. These parts of the ITU-T X.1080.x series of Recommendations give names and symbols for quantities and units concerned with:

a) emissions from the human body that can be detected by a sensor and relayed to a remote clinic; and

b) effects on the human body that can be produced by the telebiometric medical devices and robots in its environment, or by human medical staff under advice from a remote clinic.

The ITU-T X.1080.x series addresses physical, chemical, biological, culturological and psychological diagnosis, interventions and prescriptions.

This Recommendation is designed to provide wide-area communication in support of all health-related activities, where the communication can usefully be undertaken as structured messages. This includes the transmission of health, dental or DNA records, but does not seek to define the format of such records. This is left to other Standards Development Organizations.

It aims to reduce the need for medical staff and patients to be co-located, and supports both multi-party (for audit and training purposes) as well as one-to-one interactions. It recognizes that in many cases interactions between medical staff and patients need to be supplemented by unstructured voice and/or video communication, which may need synchronization with the structured message flow.

Security features are provided using the cryptographic message syntax (CMS) which provides for authentication, integrity and optionally encryption, using any appropriate security algorithm. A profile of the use of CMS for telebiometrics is defined in Annex B of [ITU-T X.1080.0].

The communications require the identification of a variety of objects ranging from medical practitioners and medical and dental record formats to drugs and surgical intervention procedures. The communication also requires identification of physiological quantities, units and values.

This Recommendation specifies ASN.1 information object classes for the identification of these objects. Other Recommendations cover the fields of physics, chemistry, biology, culturology and psychology.

Recommendation ITU-T X.1080.1

e-Health and world-wide telemedicines – Generic telecommunication protocol

1 Scope

This Recommendation describes an architecture for remote medical activity.

It specifies a generic ASN.1 protocol that uses ASN.1 information object classes to support a wide-range of medical-related formats and reports that can be carried in the protocol.

It specifies mechanisms to provide integrity and optionally encryption for the protocol interactions.

The protocol defined here is called the ITUEHP protocol (ITU-T E-Health Protocol).

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 X.509] Recommendation ITU-T X.509 (2016) | ISO/IEC 9594-8:2017, *Information technology – Open systems interconnection – The Directory: Public-key and attribute certificate frameworks.*

[ITU-T X.660] Recommendation ITU-T X.660 (2011) | ISO/IEC 9834-1:2012, *Information technology – Procedures for the operation of object identifier registration authorities: General procedures and top arcs of the international object identifier tree.*

[ITU-T X.680] Recommendation ITU-T X.680 (2015) | ISO/IEC 8824-1:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

[ITU-T X.681] Recommendation ITU-T X.681 (2015) | ISO/IEC 8824-2:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*

[ITU-T X.682] Recommendation ITU-T X.682 (2015) | ISO/IEC 8824-3:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification.*

[ITU-T X.683] Recommendation ITU-T X.683 (2015) | ISO/IEC 8824-4:2015, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.*

[ITU-T X.690] Recommendation ITU-T X.690 (2015) | ISO/IEC 8825-1:2015, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER).*

[ITU-T X.691] Recommendation ITU-T X.691 (2015) | ISO/IEC 8825-2:2015, *Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER).*

[ITU-T X.1080.0] Recommendation ITU-T X.1080.0 (2017), *Access control for telebiometrics data protection*.

[IETF RFC 5652] IETF RFC 5652 (2009), *Cryptographic Message Syntax (CMS).*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 object identifier [ITU-T X.660]: An ordered list of primary integer values from the root of the international object identifier tree to a node, which unambiguously identifies that node.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 biometrics: Automated recognition of living persons based on observation of behavioural and biological (anatomical and physiological) characteristics.

3.2.2 human physiology: The science of the mechanical, physical, and biochemical functions of normal humans or human tissues or organs.

3.2.3 medical-staff-scheme: An identification scheme produced by an authority that identifies medical practitioners and pharmaceutical staff and observers.

3.2.4 session: A communications activity that is initiated with set-up handshake sequence and terminated with a terminating sequence.

3.2.5 telebiometric multimodal model: A model of the interactions of a human being with its environment using modalities based on the human senses.

3.2.6 telebiometrics: Remote monitoring and reporting of biometric data.

3.2.7 telehealth: The use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration.

3.2.8 telemedicine: The remote diagnosis and treatment of patients by means of telecommunications technology.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ASN.1 Abstract Syntax Notation One

BPU Biometric Processing Unit

CMS Cryptographic Message Syntax

DNA Deoxyribonucleic Acid

ICT Information and Communication Technology

ISCO International Standard Classification of Occupations

ITUEHP ITU-T E-Health Protocol

OID Object Identifier

5 Conventions

This Recommendation presents abstract syntax notation one (ASN.1) notation in the **`bold courier new typeface`**. When ASN.1 types and values are referenced in normal text, they are differentiated from normal text by presenting them in the **`bold Courier New typeface`**.

If the items in a list are numbered (as opposed to using "–" or letters), then the items shall be considered steps in a procedure.

6 Architectural overview

6.1 General

The general architecture of an e-Health system is shown in Figure 1.

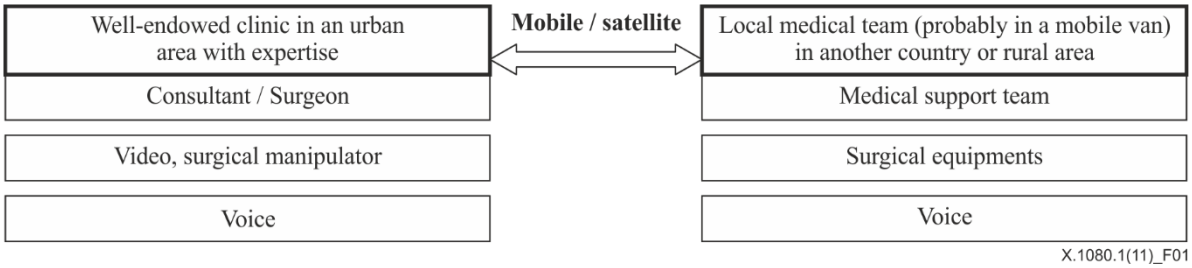

Figure 1 – General architecture of an e-Health system

Figure 2 gives details of the interaction between the medical staff and the patient.

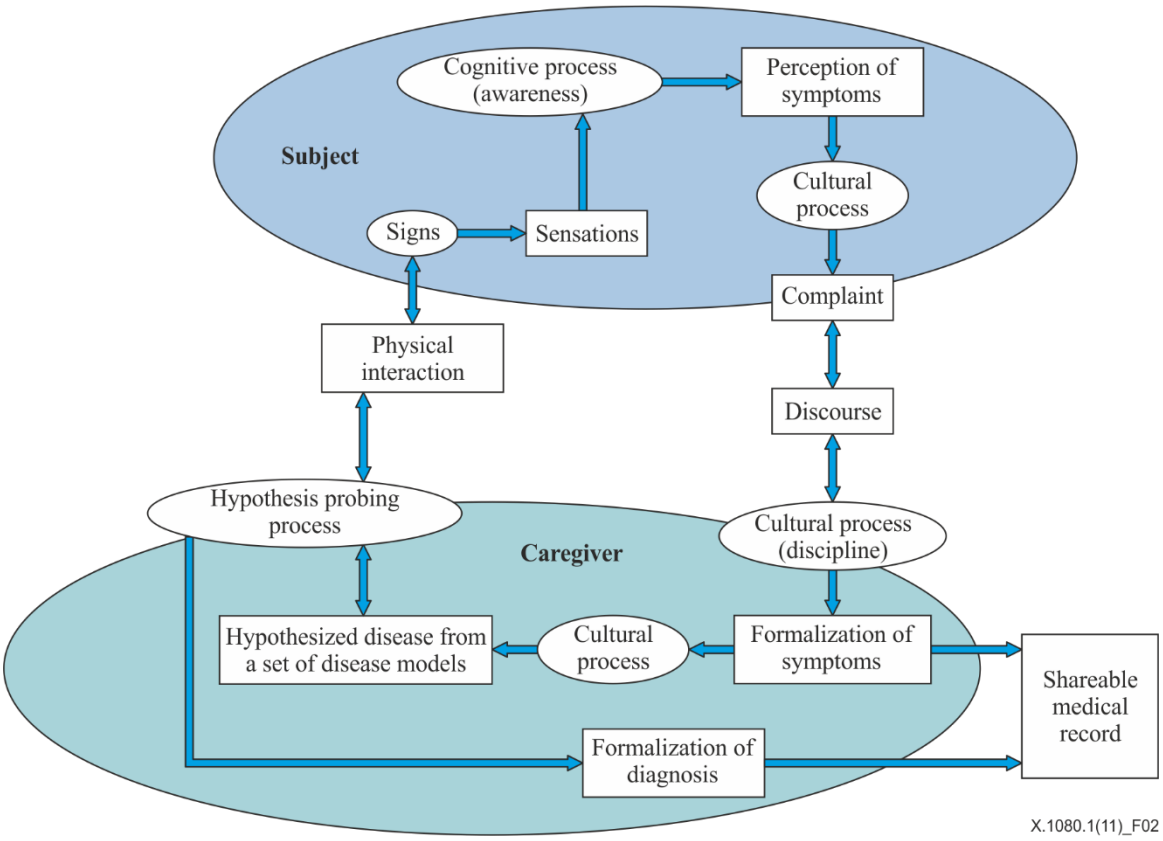

Figure 2 – Interaction between the medical staff (caregiver) and the patient (subject)

6.2 Scope of the ITU-T e-health protocol

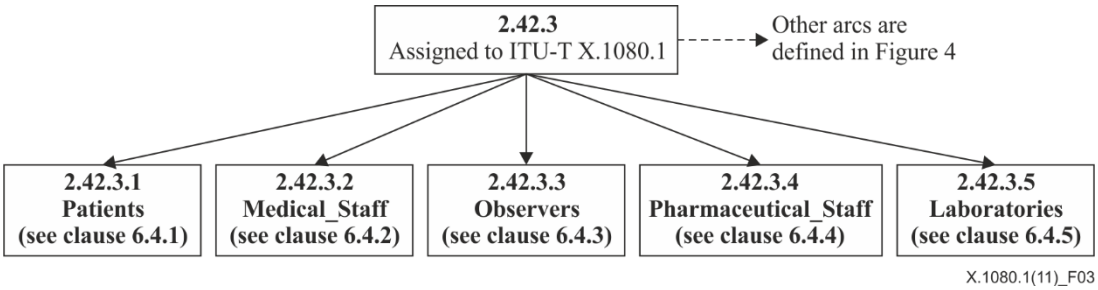

Figure 3 – General model for telebiometrics

Figure 3 illustrates the scope of the ITU-T e-health protocol.

The patient-local facility is a system at a patient location that controls equipment of different types. The patient-local facility may be either in the patient's home or in a local medical centre.

The remote expertise may be either a medical staff or some surveillance equipment. The remote expertise uses the ITU-T e-health protocol to instruct the patient-local facility to operate a piece of equipment, e.g., an instrument or sensor, in a particular way.

The protocol between the patient-local facility and a piece of equipment is determined by the type of equipment and may typically be a proprietary protocol.

There may not be a one-to-one relationship between the ITU-T e-health protocol elements and protocol elements of a sensor specific protocol. How this is resolved is outside the scope of this Recommendation.

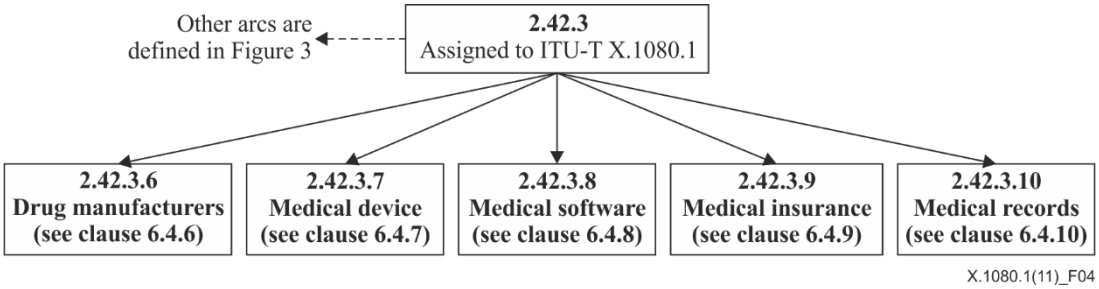

Figure 4 – Scope of e-health protocol

Figure 4 further illustrates the scope of the e-health protocol. The purpose of the protocol is simply to bring information, e.g., commands, generated by the remote expertise to the remote to patient-local facility and to bring information generated at the patient-local facility to the remote expertise.

This imposes the following requirements on the e-health protocol:

a) It shall transfer information unmodified from one end to the other, meaning messages shall be integrity protected.

b) It shall allow for the authenticity of the sender of information.

c) It shall have the capability to provide confidentiality (encryption).

The e-health protocol uses the service of cryptographic message syntax (CMS) using the CMS profile as specified in [ITU-T X.1080.0]. The CMS profile provides the necessary security providing that other general security measures are observed and that secure cryptographic algorithms are used.

6.3 Objects requiring allocation of object identifier arcs

A number of objects need identification for the protocol exchanges. In most cases, the identification scheme used will be defined by (multiple) other parties, often on a country basis. Thus, most of these objects are identified by an identification scheme that is either international or country based. Object identifiers, as specified by [ITU-T X.660], are used for identifying the relevant objects.

The aim in all cases is to provide maximum flexibility in the allocation of object identifiers to the various objects. This is further discussed in clause 7.

Object identifiers to identify one of these types of objects is outlined below, but is specified more fully in later clauses.

a) patients (usually identified by a patient record identifier from some country, but otherwise just identity information);

b) medical staff involved in diagnosis, consultancy, or involved in an intervention, usually (but not necessarily) identified by a registration number issued by some country and/or by the hierarchical code of occupation like the international standard classification of occupations (ISCO) defined by the International Labour Organization (ILO) (see [b-ILO ISCO]);

c) observers for training and/or audit purposes; these may only have a name and location or affiliation;

d) pharmaceutical staff involved in dispensing; again, it is expected that there will be a registration number issued by some country and by the hierarchical code of the occupation like the ISCO defined by ILO (see [b-ILO ISCO]);

e) laboratories, which provide analysis, probably identified by name and location and their qualifications;

f) drug manufacturing companies and associated laboratories, probably identified by name and location of head office, or by country and company registration number and other types of remedial devices and service providers;

g) types of medical sensor or intervention device, probably identified by the name and location of the manufacturer, and by their designation of the type and serial number of the device;

h) software associated with driving a medical sensor or intervention device;

i) medical insurance companies, probably identified by name and location of head office, or by country and company registration number;

j) medical (including dental) record formats; again, the format will usually be based on the country defining the format, but some formats will be international.

NOTE – Additional objects, with ASN.1 identifications of an information object class, specified in a manner similar to clauses 8 may also be defined.

7 Allocation of object identifier arcs

7.1 Top level object identifiers for telebiometrics

As specified in [ITU-T X.1080.0], the following arc is allocated for telebiometrics:

```
id-telebio OBJECT IDENFIER ::= { joint-iso-itu-t(2) telebiometrics(42) }
```

The following arc is allocated to identification of objects related to the use within the e-health protocol:

```
id-thprot OBJECT IDENTIFIER ::= { id-telebio thprot(10) }
```

The following arc is allocated to identification of quantities related to the telebiometric multimodal model (TMM):

```
id-tmm OBJECT IDENTIFIER ::= {id-telebio tmm(1)}
```

The following arc is allocated to identification of quantities related to the human physiology:

```
id-hum-phys OBJECT IDENTIFIER ::= {id-telebio human-physiology(2)}
```

The following arc is allocated for the definition of object categories:

```
id-obj-cat OBJECT IDENTIFIER ::= { id-telebio obj-cat(3) }
```

7.2 Top level object identifier arcs for this Recommendation

In according with Annex A of [ITU-T X.1080.0], the following top object identifier arcs are allocated to this Recommendation:

```
id-x1080-1 OBJECT IDENTIFIER ::= { id-telehealth part1(1) }
```

The following arc is allocated to identification of modules defined by this Recommendation:

```
id-x1080-1-modules OBJECT IDENTIFIER ::= { id-x1080-1 module(0) }
```

The following arc is allocated to identification of CMS content types defined by this Recommendation:

```
id-x1080-1-cms-content OBJECT IDENTIFIER ::= { id-x1080-1 cms-content(1) }
```

7.3 Allocation of object identifier arcs for CMS content types

The content type for the establishment of a session is identified by:

```
id-health-setup-req OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-setup-req(1) }
```

The content type for accepting a session is identified by:

```
id-health-setup-rsp OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-setup-rsp(2) }
```

The content type for reporting an error during session establishment is identified by:

```
id-health-setup-err OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-setup-err(3) }
```

The content type for the initiation of a session termination is identified by:

```
id-health-term-req OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-term-req(4) }
```

The content type for the completion of a session termination is identified by:

```
id-health-term-rsp OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-term-rsp(5) }
```

The content type for reporting a session termination error is identified by:

```
id-health-term-err OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-term-err(6) }
```

8 Identification of objects

8.1 General

This clause defines ASN.1 information object classes for different types of objects relevant for telebiometrics.

The ten identifiers for categories of objects are defined using the following information object class:

```
IDENTIFICATION ::= CLASS {
  &category       OBJECT IDENTIFIER UNIQUE,
  &Identification }
WITH SYNTAX {
  CATEGORY        &category
  IDENTIFIED WITH &Identification }
```

and the following sequence type:

```
Identification ::= SEQUENCE {
  category       IDENTIFICATION.&category({Categories}),
  identification IDENTIFICATION.&Identification({Categories}{@category}) }
```

The ten objects of the following `Categories` object set are defined in clauses 8.2 to 8.12.

```
Categories IDENTIFICATION ::= {
  patientIdentification |
  medicalStaffIdentification |
  observerIdentification |
  pharmaceuticalStaffIdentification |
  laboratoryIdentification |
  manufacturerIdentification |
  deviceIdentification |
  softwareIdentification |
  insuranceIdentification |
  medicalRecordIdentification,
  ... }
```

8.2 Allocation of object identifier arcs for object categories

There are 10 arcs allocated for identifying object categories.

The category *patient* is identified by:

```
id-patient OBJECT IDENTIFIER ::= { id-obj-cat patient(1) }
```

The category *medical staff* is identified by:

```
id-med-staff OBJECT IDENTIFIER ::= { id-obj-cat med-staff(2) }
```

The category *observers* is identified by:

```
id-observer OBJECT IDENTIFIER ::= { id-obj-cat observer(3) }
```

The category *pharmaceutical staff* is identified by:

```
id-pharm-staff OBJECT IDENTIFIER ::= { id-obj-cat pharm-staff(4) }
```

The category *laboratories* is identified by:

```
id-lab OBJECT IDENTIFIER ::= { id-obj-cat lab(5) }
```

The category *drug manufacturers* is identified by:

```
id-drug-manufac OBJECT IDENTIFIER ::= { id-obj-cat drug-manufac (6) }
```

The category *medical devices* is identified by:

```
id-med-device OBJECT IDENTIFIER ::= { id-obj-cat med-device(7) }
```

The category *medical software* is identified by:

```
id-med-softw OBJECT IDENTIFIER ::= { id-obj-cat med-softw(8) }
```

The category *medical insurance* is identified by:

```
id-med-insur OBJECT IDENTIFIER ::= { id-obj-cat med-insur(9) }
```

The category *medical records* is identified by:

```
id-med-rec OBJECT IDENTIFIER ::= { id-obj-cat med-rec(10) }
```

8.3 Identification of patients

A patient is identified using the `PatientIdentification` ASN.1 object:

```
patientIdentification   IDENTIFICATION ::= {
  CATEGORY        id-patient
  IDENTIFIED WITH PatientIdentification }

PatientIdentification ::= SEQUENCE {
  scheme         PATIENT-SCHEME.&id ({PatientSchemes}),
  schemeName     PATIENT-SCHEME.&name ({PatientSchemes}{@.scheme}) OPTIONAL,
  patientId      PATIENT-SCHEME.&Identification ({PatientSchemes}{@.scheme}) }
```

The information object class `PATIENT-SCHEME` is used to define patient schemes.

```
PATIENT-SCHEME ::= CLASS {
  &id             OBJECT IDENTIFIER UNIQUE,
  &name           SchemeName OPTIONAL,
  &Identification }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification }

SchemeName ::= CHOICE {
  string   ISO646String,
  oid      OBJECT IDENTIFIER,
  ... }
```

The following object set should be replaced by specific schemes by a referencing specification or an implementers' agreement:

```
PatientSchemes PATIENT-SCHEME ::= {...}
```

`Patient-schemes` is the object set containing all the supported patient schemes.

The `PATIENT-SCHEME.&id` is unique, and identifies any patient identification scheme that has been defined and allocated an object identifier value.

The `PATIENT-SCHEME.&name` is a choice between an `ISO646String` describing the schema or an object identifier identifying the scheme. If the `ISO646String` alternative is taken, the name is not necessarily unique.

The `PATIENT-SCHEME.&identification` is the identification of the patient within that scheme, and is a type specified when an information object of class `PATIENT-SCHEME` is established. It will typically include at least a unique number and the patient's name.

NOTE – Establishment of patient identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and with references to the organization defining them.

8.4 Identification of medical staff

A member of the medical profession (including doctors, surgeons, nurses, dentists, physiotherapies, psychologists, etc., but excluding pharmaceutical staff, which are a separate category) is identified using the ASN.1 type `MedicalStaffIdentification`:

```
medicalStaffIdentification IDENTIFICATION ::= {
```

```
  CATEGORY          id-med-staff
  IDENTIFIED WITH   MedicalStaffIdentification }

MedicalStaffIdentification ::= SEQUENCE {
  scheme           MEDICAL-STAFF-SCHEME.&id ({MedicalStaffSchemes}),
  schemeName       MEDICAL-STAFF-SCHEME.&name
                   ({MedicalStaffSchemes}{@.scheme}) OPTIONAL,
  medicalStaffId   MEDICAL-STAFF-SCHEME.&Identification
                   ({MedicalStaffSchemes}{@.scheme}),
  qualifications   MEDICAL-STAFF-SCHEME.&Qualifications
                  ({MedicalStaffSchemes}{@.scheme}) OPTIONAL}

MEDICAL-STAFF-SCHEME ::= CLASS {
  &id               OBJECT IDENTIFIER UNIQUE,
  &name             SchemeName OPTIONAL,
  &Identification,
  &Qualifications,
  &Observer }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification
  WITH &Qualifications AND &Observer }

MedicalStaffSchemes MEDICAL-STAFF-SCHEME ::= {...}
```

The information object class **MEDICAL-STAFF-SCHEME** is used to define medical staff schemes and covers this clause and clauses 6.4.3 and 6.4.4. **MedicalStaffSchemes** is the object set containing all the supported medical staff schemes.

The **MEDICAL-STAFF-SCHEME.&id** is unique, and identifies any health professional identification scheme that has been defined and allocated an object identifier value.

The **MEDICAL-STAFF-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **MEDICAL-STAFF-SCHEME.&identification** is the identification of the health professional within that scheme, and is a type specified when an information object of class **MEDICAL-STAFF-SCHEME** is established. It will typically include at least a unique number and the health professional's name and category or role.

NOTE 1 – Establishment of health professional identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them.

The **MEDICAL-STAFF-SCHEME.&qualifications** is the identification of the professional qualifications recognized within that identification scheme. It is a type specified when an information object of class **MEDICAL-STAFF-SCHEME** is established. It will typically include the identification of some qualification(s) issued by known authorities, and signed by those authorities. Thus, the type will typically include public-key certificates as defined by [ITU-T X.509] to support the signatures on the qualifications.

NOTE 2 – Definition of health professional qualifications is outside the scope of this Recommendation, but future amendments may record in an appendix types that have been defined for use with any given scheme.

8.5 Identification of observers

An observer may be a law enforcement officer, a medical student, etc. and will generally not have a qualification recognized by the health professional identification scheme. An observer is identified by the ASN.1 type **ObserverIdentification**:

```
observerIdentification  IDENTIFICATION ::= {
  CATEGORY          id-observer
```

```
  IDENTIFIED WITH ObserverIdentification }

ObserverIdentification ::= SEQUENCE {
  scheme      MEDICAL-STAFF-SCHEME.&id ({MedicalStaffSchemes}),
  schemeName  MEDICAL-STAFF-SCHEME.&name ({MedicalStaffSchemes}{@.scheme})
              OPTIONAL,
  observerId  MEDICAL-STAFF-SCHEME.&Observer ({MedicalStaffSchemes}{@.scheme})}
```

The information object class **MEDICAL-STAFF-SCHEME** is used to define medical staff schemes. **MedicalStaffSchemes** is the object set containing all the supported medical staff schemes.

The **MEDICAL-STAFF-SCHEME.&id** is unique, and identifies any health professional numbering scheme that has been defined and allocated an object identifier value.

The **MEDICAL-STAFF-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **MEDICAL-STAFF-SCHEME.&observer** is the identification of observers in remote interactions using the ITUEHP protocol. It is a type specified when an information object of class **MEDICAL-STAFF-SCHEME** is established. It is unlikely to contain any unique identification, but will normally be descriptive of the role of the observer and their name.

8.6 Identification of pharmaceutical staff

A member of the pharmaceutical profession, including laboratory staff performing analyses, may be identified using the ASN.1 type **PharmaceuticalStaffIdentification**:

```
pharmaceuticalStaffIdentification IDENTIFICATION ::= {
  CATEGORY        id-pharm-staff
  IDENTIFIED WITH PharmaceuticalStaffIdentification }

PharmaceuticalStaffIdentification ::= SEQUENCE {
  scheme          MEDICAL-STAFF-SCHEME.&id ({MedicalStaffSchemes}),
  schemeName      MEDICAL-STAFF-SCHEME.&name ({MedicalStaffSchemes}{@.scheme})
OPTIONAL,
  medicalStaffId  MEDICAL-STAFF-SCHEME.&Identification
({MedicalStaffSchemes}{@.scheme}),
  qualifications  MEDICAL-STAFF-SCHEME.&Qualifications
({MedicalStaffSchemes}{@.scheme}) OPTIONAL}
```

The information object class **MEDICAL-STAFF-SCHEME** is used to define pharmaceutical schemes. **MedicalStaffSchemes** is the object set containing all the supported medical staff schemes.

The **MEDICAL-STAFF-SCHEME.&id** is unique, and identifies any health professional identification scheme that has been defined and allocated an object identifier value.

The **MEDICAL-STAFF-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **MEDICAL-STAFF-SCHEME.&identification** is the identification of the pharmaceutical professional within that scheme, and is a type specified when an information object of class **MEDICAL-STAFF-SCHEME** is established. It will typically include at least a unique number and professionals name and category or role.

NOTE 1 – Establishment of health professional identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them.

The **MEDICAL-STAFF-SCHEME.&qualifications** is the identification of the professional qualifications of a pharmaceutical or laboratory professional recognized within that identification scheme. It is a type

specified when an information object of class **MEDICAL-STAFF-SCHEME** is established. It will typically include the identification of some qualification(s) issued by known authorities, and signed by those authorities. Thus, the type will typically include public-key certificates to support the signatures on the qualifications.

NOTE 2 – Definition of professional qualifications is outside the scope of this Recommendation, but future amendments may record in an appendix the types that have been defined for use with any given scheme.

8.7 Identification of laboratories

A laboratory performing analyses is identified using the ASN.1 type **LaboratoryIdentification**:

```
laboratoryIdentification IDENTIFICATION ::= {
  CATEGORY        id-lab
  IDENTIFIED WITH LaboratoryIdentification }

LaboratoryIdentification ::= SEQUENCE {
  scheme          LABORATORY-SCHEME.&id ({LaboratorySchemes}),
  schemeName      LABORATORY-SCHEME.&name ({LaboratorySchemes}{@.scheme})
                  OPTIONAL,
  qualifications LABORATORY-SCHEME.&Qualifications
                  ({LaboratorySchemes}{@.scheme}) OPTIONAL}

LABORATORY-SCHEME ::= CLASS {
  &id          OBJECT IDENTIFIER UNIQUE,
  &name        SchemeName    OPTIONAL,
  &Qualifications }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id WITH &Qualifications }

LaboratorySchemes LABORATORY-SCHEME ::= {...}
```

The information object class **LABORATORY-SCHEME** is used to define laboratory schemes. **LaboratorySchemes** is the object set containing all the supported laboratory schemes.

The **LABORATORY-SCHEME.&id** is unique, and identifies any laboratory scheme that has been defined and allocated an object identifier value.

The **LABORATORY-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **LABORATORY-SCHEME.&qualifications** is the qualifications of laboratory within that identification scheme. It is a type specified when an information object of class **LABORATORY-SCHEME** is established. It will typically include the identification of some qualification(s) issued by known authorities, and signed by those authorities. Thus, the type will typically include public-key certificates to support the signatures on the qualifications.

NOTE – Definition of laboratory qualifications is outside the scope of this Recommendation, but future amendments may record in an appendix types that have been defined for use with any given scheme.

8.8 Identification of drug manufacturers and drugs

A drug manufacturer or laboratory producing drugs is identified using the ASN.1 type

```
manufacturerIdentification IDENTIFICATION ::= {
  CATEGORY        id-drug-manufac
  IDENTIFIED WITH ManufacturerIdentification }

ManufacturerIdentification ::= SEQUENCE {
  scheme          MANUFACTURER-SCHEME.&id ({ManufacturerSchemes}),
  schemeName      MANUFACTURER-SCHEME.&name ({ManufacturerSchemes}{@.scheme})
OPTIONAL,
```

```
  manufacturerId MANUFACTURER-SCHEME.&Manufacturer
({ManufacturerSchemes}{@.scheme}),
  drugId         MANUFACTURER-SCHEME.&Drug ({ManufacturerSchemes}{@.scheme})}

MANUFACTURER-SCHEME ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
  &name         SchemeName OPTIONAL,
  &Manufacturer,
  &Drug }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
  PRODUCING &Drug }

ManufacturerSchemes MANUFACTURER-SCHEME ::= {...}
```

The information object class `MANUFACTURER-SCHEME` is used to define manufacturer schemes. `ManufacturerSchemes` is the object set containing all the supported manufacturer schemes.

The `MANUFACTURER-SCHEME.&id` is unique, and identifies any manufacturer identification scheme that has been defined and allocated an object identifier value.

The `MANUFACTURER-SCHEME.&name` is a choice between an `ISO646String` describing the schema or an object identifier identifying the scheme. If the `ISO646String` alternative is taken, the name is not necessarily unique.

The `MANUFACTURER-SCHEME.&manufacturer` is the identification of the manufacturer within that scheme, and is a type specified when an information object of class `MANUFACTURER-SCHEME` is established. It will typically include the name of the manufacturer or the laboratory and location of head office, and perhaps a unique reference such as a company number.

The `MANUFACTURER-SCHEME.&drug` is the identification of a drug produced by the manufacturer or laboratory identified in `MANUFACTURER-SCHEME.&manufacturer`, and is a type specified when an information object of class `MANUFACTURER-SCHEME` is established. It will typically include the name of the manufacturer or the laboratory and location of head office, and perhaps a unique reference such as a company number.

NOTE – Establishment of manufacturer identification schemes is outside the scope of this Recommendation, but future amendments to other parts of the ITU-T X.1080.x series may record in an appendix schemes that have been defined and the organization defining them.

8.9 Identification of medical devices

A medical device is identified using the ASN.1 type `DeviceIdentification`:

```
DEVICE-SCHEME ::= CLASS {
  &id                 OBJECT IDENTIFIER UNIQUE,
  &name               SchemeName OPTIONAL,
  &Manufacturer,
  &Device,
  &supportedFormats   Supported-formats }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
  PRODUCING &Device SUPPORTING &supportedFormats}

Supported-formats ::= CHOICE {
  oids  SEQUENCE OF OBJECT IDENTIFIER,
  ... }

deviceIdentification IDENTIFICATION ::= {
  CATEGORY        id-med-device
  IDENTIFIED WITH DeviceIdentification }

DeviceIdentification ::= SEQUENCE {
```

```
  scheme          DEVICE-SCHEME.&id({DeviceSchemes}),
  schemeName      DEVICE-SCHEME.&name ({DeviceSchemes}{@.scheme}) OPTIONAL,
  manufacturerId DEVICE-SCHEME.&Manufacturer ({DeviceSchemes}{@.scheme})
                     OPTIONAL,
  device          DEVICE-SCHEME.&Device ({DeviceSchemes}{@.scheme}),
  formats         DEVICE-SCHEME.&supportedFormats ({DeviceSchemes}{@.scheme})}

DeviceSchemes DEVICE-SCHEME ::= {...}
```

The information object class **DEVICE-SCHEME** is used to define device schemes. **DeviceSchemes** is the object set containing all the supported device schemes.

The **DEVICE-SCHEME.&id** is unique, and identifies any medical device identification scheme that has been defined and allocated an object identifier value.

The **DEVICE-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **DEVICE-SCHEME.&manufacturer** is the identification of a manufacturer within that scheme, and is a type specified when an information object of class **DEVICE-SCHEME** is established. It would be optional if a generic term for the device (such as "scalpel") is used in **DEVICE-SCHEME.&device.** Otherwise, it will typically include the name of the manufacturer of the device and location of head office, and perhaps a unique reference such as a company number.

The **DEVICE-SCHEME.&device** is the identification of a medical device. It may be a simple generic description of the device, or may be a complete product reference to a device from the specified manufacturer identified in **DEVICE-SCHEME.&manufacturer**, and is a type specified when an information object of class **DEVICE-SCHEME** is established.

The **DEVICE-SCHEME.&supported formats** is the identification of data formats to be used for communication with that device. This will typically be a sequence of object identifiers referencing the specification of available formats and their effect for interaction with that device. The device may be a sensor sending information, or may be an intervention device.

NOTE – Establishment of device identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them for the identification of devices.

8.10 Identification of medical software

Medical software is identified using the ASN.1 type **SoftwareIdentification**:

```
softwareIdentification  IDENTIFICATION ::= {
  CATEGORY        id-med-softw
  IDENTIFIED WITH SoftwareIdentification }

SOFTWARE-SCHEME ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
  &name         SchemeName OPTIONAL,
  &Manufacturer,
  &Software }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
  PRODUCING &Software }

SoftwareIdentification ::= SEQUENCE {
  scheme          SOFTWARE-SCHEME.&id({SoftwareSchemes}),
  schemeName      SOFTWARE-SCHEME.&name ({SoftwareSchemes}{@.scheme}) OPTIONAL,
  manufacturerId  SOFTWARE-SCHEME.&Manufacturer ({SoftwareSchemes}{@.scheme})
                    OPTIONAL,
  software        SOFTWARE-SCHEME.&Software ({SoftwareSchemes}{@.scheme})}

SoftwareSchemes    SOFTWARE-SCHEME ::= {...}
```

The information object class **SOFTWARE-SCHEME** is used to define software schemes. **SoftwareSchemes** is the object set containing all the supported software schemes.

The **SOFTWARE-SCHEME.&id** is unique, and identifies any software identification scheme that has been defined and allocated an object identifier value.

The **SOFTWARE-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **SOFTWARE-SCHEME.&manufacturer** is the identification of a manufacturer within that scheme, and is a type specified when an information object of class **SOFTWARE-SCHEME** is established. It would be optional if a generic term for the software is used in **SOFTWARE-SCHEME.&software-id.** Otherwise, it will typically include the name of the manufacturer of the software and location of head office, and perhaps a unique reference such as a company number.

The **SOFTWARE-SCHEME.&software** is the identification of piece of medical software. It may be a simple generic description of the software, or may be a complete product reference to software from the specified manufacturer identified in **SOFTWARE-SCHEME.&manufacturer**, and is a type specified when an information object of class **SOFTWARE-SCHEME** is established.

NOTE – Establishment of software identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them for the identification of software.

8.11 Identification of medical insurances

A medical insurance is identified using the ASN.1 type **Insurance-Identification**:

```
insuranceIdentification IDENTIFICATION ::= {
  CATEGORY        id-med-insur
  IDENTIFIED WITH InsuranceIdentification }

InsuranceIdentification ::= SEQUENCE {
  scheme          INSURANCE-SCHEME.&id({InsuranceSchemes}),
  schemeName      INSURANCE-SCHEME.&name ({InsuranceSchemes}{@.scheme}) OPTIONAL,
  manufacturerId INSURANCE-SCHEME.&Company ({InsuranceSchemes}{@.scheme}),
```

```
  insurance      INSURANCE-SCHEME.&InsuranceType ({InsuranceSchemes}{@.scheme}),
  insuranceCert  INSURANCE-SCHEME.&Certification ({InsuranceSchemes}{@.scheme})}

INSURANCE-SCHEME ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
  &name         SchemeName OPTIONAL,
  &Company,
  &InsuranceType,
  &Certification }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Company
  USING &InsuranceType CERTIFIED WITH &Certification }

InsuranceSchemes INSURANCE-SCHEME ::= {...}
```

The information object class **INSURANCE-SCHEME** is used to define insurance schemes. **InsuranceSchemes** is the object set containing all the supported insurance schemes.

The **INSURANCE-SCHEME.&id** is unique, and identifies any insurance identification scheme that has been defined and allocated an object identifier value.

The **INSURANCE-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

The **INSURANCE-SCHEME.&company** is the identification within that scheme of the company that issued the medical insurance, and is a type specified when an information object of class **INSURANCE-SCHEME** is established. It will typically include the name of the company issuing the medical insurance and location of head office, perhaps a unique reference such as a company number, and typically contact details.

The **INSURANCE-SCHEME.&type** specifies the type of medical insurance (relative to the insurance company) that has been issued.

The **INSURANCE-SCHEME.&certification** is the reference number for the insurance obtained, with identification of the person it was issued to (see also clause 6.4.1). It will be signed by the insurance company, and hence this type will contain a public-key certificate.

NOTE – Establishment of insurance identification schemes is outside the scope of this Recommendation, but future amendments may record in an appendix schemes that have been defined and the organization defining them for the identification and certification of insurances.

8.12 Identification and inclusion of medical and dental records and DNA profiles

Medical records, including dental records and deoxyribonucleic acid (DNA) profiles, can be identified and included using the ASN.1 type **Medical-Record**:

```
medicalRecordIdentification IDENTIFICATION ::= {
  CATEGORY        id-med-rec
  IDENTIFIED WITH MedicalRecordIdentification }

MedicalRecordIdentification ::= SEQUENCE {
  scheme       MEDICAL-RECORD-SCHEME.&id ({MedicalRecordSchemes}),
  schemeName   MEDICAL-RECORD-SCHEME.&name ({MedicalRecordSchemes}{@.scheme})
                 OPTIONAL,
  definingOrg  MEDICAL-RECORD-SCHEME.&Organisation
                 ({MedicalRecordSchemes}{@.scheme}),
  recordType   MEDICAL-RECORD-SCHEME.&RecordType
                 ({MedicalRecordSchemes}{@.scheme}),
  record       MEDICAL-RECORD-SCHEME.&Record ({MedicalRecordSchemes}{@.scheme})}

MEDICAL-RECORD-SCHEME   ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
```

```
  &name          SchemeName OPTIONAL,
  &Organisation,
  &RecordType,
  &Record }
WITH SYNTAX {
  SCHEME
  [NAME          &name]
  IDENTIFIED BY &id
  FOR            &Organisation
  USING          &RecordType
  WITH FORMAT    &Record }

MedicalRecordSchemes    MEDICAL-RECORD-SCHEME ::= {...}
```

The information object class **MEDICAL-RECORD-SCHEME** is used to define medical record schemes. **MedicalRecordSchemes** is the object set containing all the supported medical-record schemes.

The **MEDICAL-FORMAT-SCHEME.&id** is unique, and identifies any medical format identification scheme that has been defined and allocated an object identifier value.

The **MEDICAL-RECORD-SCHEME.&name** is a choice between an **ISO646String** describing the schema or an object identifier identifying the scheme. If the **ISO646String** alternative is taken, the name is not necessarily unique.

MEDICAL-RECORD-SCHEME.&organisation is the identification within that scheme of the organization that defined that record format, and is a type specified when an information object of class **MEDICAL-RECORD-SCHEME** is established. It will typically include the name of the organization defining the format, which will typically be a government department of some country, or an international standards organization.

The **MEDICAL-RECORD-SCHEME.&record-type** specifies the type of medical record (relative to the defining organization).

The **MEDICAL-RECORD-SCHEME.&record** contains an instance of a record of the defined record type. The ASN.1 type of **MEDICAL-RECORD-SCHEME.&record** will be defined when an object of the type **MEDICAL-RECORD-SCHEME** is defined. It will typically contain an encrypted form of the medical record, certificates to determine the authenticity, and a security block to provide encryption parameters.

NOTE – Use of the ITUEHP includes the optional application of encryption and integrity using CMS in all transfers, but it is expected that for the type **MEDICAL-RECORD-SCHEME.&record**, there will be an additional layer of encryption and integrity provided within the record type itself.

9 General model and use of cryptographic message syntax (CMS)

By the application of cryptographic message syntax (CMS) as defined by [IETF RFC 5652] to the generic telecommunication protocol, it is possible to provide for authentication, integrity and confidentiality as specified in Annex B of [ITU-T X.1080.0].

A particular telebiometrics activity, called a session, is initiated by a set-up sequence, it is then followed by the data transfer phase and it is finally terminated by a termination sequence.

Messages are defined and protected using CMS content types, using both standard content type as described in Annex B of [ITU-T X.1080.0] and telebiometrics specific content types as specified by this Recommendation and other telebiometrics specifications.

A content type is defined by the **CONTENT-TYPE** ASN.1 information object class:

An instance of this information object class provides a binding between the identification of the content type and the abstract syntax of the actual content.

This Recommendation defines the content types used for session establishment and terminations, while the content types for the actual data exchange are defined by the relevant telebiometrics specifications.

This Recommendation includes the specification for an ASN.1 information object class used for defining telebiometrics specific protocols.

In addition to specify the abstract syntax for the content types, a session specification shall also specify:

a) who may initiate session establishment; and

b) who may terminate an established session.

10 Interactive operation

10.1 The interactive operation information object class

The **INTERACTIVE-OPERATION** information object class is used for defining an interactive operation type.

```
INTERACTIVE-OPERATION ::= CLASS {
  &id                INTEGER (0..MAX),
  &content-req       CONTENT-TYPE.&id  OPTIONAL,
  &content-rsp       CONTENT-TYPE.&id  OPTIONAL,
  &content-err       CONTENT-TYPE.&id  OPTIONAL,
  &sessionType       SessionType,
  &requirements      Requirements              DEFAULT none,
  &Voice-options                               OPTIONAL,
  &Video-options                               OPTIONAL,
  &Request,
  &Response                                    OPTIONAL,
  &Error                                       OPTIONAL,
  &exhangeMode       ExchangeMode              DEFAULT sync,
WITH SYNTAX {
  OPERATION-ID       &id
  [CONTENT-REQ       &content-req]
  [CONTENT-RSP       &content-rsp]
  [CONTENT-ERR       &content-err]
  SESSION-TYPE       &sessionType
  [REQUIRING         &requirements]
  [VOICE OPTIONS     &Voice-options]
  [VIDEO OPTIONS     &Video-options]
  REQUEST            &Request
  [RESPONSE          &Response]
  [ERROR             &Error]
  [EXCHANGE MODE     &exhangeMode] }

ExchangeMode ::= ENUMERATED {
  sync     (0),
  async    (1),
  ... }

InteractiveOperations INTERACTIVE-OPERATION ::= { ... }
```

The **INTERACTIVE-OPERATION** information object has the following fields:

a) The **&id** field is used for assigning an integer that uniquely identifies the types of operation type within the scope of the session. When required, the value 0 is used to identify the **exit** operation and shall therefore not be used for other types of operations.

b) The **&sessionType** field is used for specifying within which session type this interactive operation is to be defined. The session type shall be an object identifier that goes into the content type identifying the session type to which this operation belongs.

c) The **&requirements** field is used for defining voice and video requirements. If this field is not specified, it defaults to **none**.

d) The **&Voice-options** field, when present, shall specify the data type used for specifying the voice options. This field may be present if the **&requirements** field does not specify **none**. Otherwise, it shall be absent.

e) The **&Video-options** field, when present, shall specify the data type used for specifying the video options. This field may be present if the **&requirements** field specifies **with-reverse-video-and-2-way-voice** or **with-2-way-video-and-voice**. Otherwise, it shall be absent.

f) The **&Request** field is used for identifying the data type for the value going into the request of the defined operation.

g) The **&Response** field, when present, is used for identifying the data type for the value going into the response of the defined operation. If this field is absent, no response is defined for the type of operation.

h) The **&Error** field, when present, is used for identifying the data type for the value going into an error message resulting from an exception condition experienced by the defined operation. If this field is absent, no error is defined for this type of operation.

i) The **&exhangeMode** field, when present, specifies possible restriction on the message flow. It shall be absent if the **&Response** field is absent. If it specifies **sync**, the sender of this operation shall not initiate any other operation until a response or error message for the operation is received. If it specifies **async** (default), no such restriction exists.

10.2 Content type templates

The following data types specify the general syntax for requests, responses and error messages.

```
RequestContent ::= SEQUENCE {
  contentType   INTERACTIVE-OPERATION.&content-req,
  content       SEQUENCE {
    invokId       INTEGER (0..MAX)                          OPTIONAL,
    sessionType   INTERACTIVE-OPERATION.&sessionType,
    sessionId     INTEGER (0..MAX),
    requirement   INTERACTIVE-OPERATION.&requirements    DEFAULT none,
    voice-options INTERACTIVE-OPERATION.&Voice-options   OPTIONAL,
    video-options INTERACTIVE-OPERATION.&Video-options   OPTIONAL,
    request       INTERACTIVE-OPERATION.&Request,
    exchangeMode  INTERACTIVE-OPERATION.&exchangeMode    DEFAULT sync,
    ... },
  ... }

ResponseContent ::= SEQUENCE {
  contentType   INTERACTIVE-OPERATION.&content-rsp,
  content       SEQUENCE {
    invokId       INTEGER (0..MAX)  OPTIONAL,
    sessionType   INTERACTIVE-OPERATION.&sessionType,
    sessionId     INTEGER (0..MAX),
    response      INTERACTIVE-OPERATION.&Response,
    ... },
  ... }

ErrorContent ::= SEQUENCE {
  contentType   INTERACTIVE-OPERATION.&content-err,
  content       SEQUENCE {
    invokId       INTEGER (0..MAX)  OPTIONAL,
```

```
    sessionType   INTERACTIVE-OPERATION.&sessionType,
    sessionId     INTEGER (0..MAX),
    error         INTERACTIVE-OPERATION.&Error,
    ... },
  ... }
```

11 Session management

This clause specifies some common content types for use by other parts of the ITU-T X.1080.x series.

11.1 Session establishment

11.1.1 The health setup request content type

An instance of the **health-setup-req** content type shall be used by the initiator of a session to request the establishment of the session.

```
health-setup-req CONTENT-TYPE ::= {
                 E-setupRequest
  IDENTIFIED BY  id-health-setup-req }
```

The **health-setup-req** content type shall be identified by the object identifier **id-health-setup-req**.

```
E-setupRequest ::= SEQUENCE {
  sessionType  SessionType,
  sessionId    SessionId,
  requirement  Requirements  DEFAULT none,
  voiceOptions VoiceOptions  OPTIONAL,
  videoOptions VideoOptions  OPTIONAL,
  returnMode   ReturnMode,
  sensorId     UTF8String  OPTIONAL,
  operations   SET SIZE (1..MAX) OF
    INTERACTIVE-OPERATION.&id ({SupportedOperationTypes}),
  first        INTERACTIVE-OPERATION.&id ({SupportedOperationTypes})
                 OPTIONAL,
  ... }

SessionType ::= OBJECT IDENTIFIER

SessionID ::= INTEGER (1..32767)

Requirements ::= ENUMERATED {
  none                                (0),
  with-2-way-voice                    (1),
  with-reverse-video-and-2-way-voice  (2),
  with-2-way-video-and-voice          (3),
  ... }

VoiceOptions ::= OBJECT IDENTIFIER

VideoOptions ::= OBJECT IDENTIFIER

ReturnMode ::= ENUMERATED {
  continuous (0),
  batch      (1),
  ... }
```

The **E-setupRequest** data type has the following components:

a) The **sessionType** component shall identify the type of session to be established. The identifying object identifier shall be allocated by the telebiometrics specification within which the session type is defined.

b) The **sessionId** component shall be an integer that uniquely identifies this session among multiple sessions of the same type in the scope of the communication between two entities. This identifier may be reused when the current session has been terminated.

c) The **returnMode** component shall specify the mode for returning the result of an operation. The information generated during the sensing may be returned by the patient-local facility as it is generated or it may be locally collected and subsequently submitted to the remote expertise:

- the **continuous** selection specifies that result shall be returned as they are generated;
- the **batch** selection specifies that the result shall be collected and returned at the end of the sensing session or when requested.

d) The **sensorId** component, when present, shall identify a particular device when multiple devices may be used for the intended purpose.

e) The **operations** component shall identify the interactive operation types that may be executed as part of the session.

f) The **first** component, when present, shall identify the first interactive operation type to be initiated after the session has been established.

11.1.2 The health setup result content type

An instance of the **health-setup-res** content type shall be used by the responder to complete the establishment of the session.

```
health-setup-rsp CONTENT-TYPE ::= {
                 E-setupResponse
  IDENTIFIED BY  id-health-setup-rsp }
```

The **health-setup-rsp** content type shall be identified by the object identifier **id-health-setup-rsp**.

```
E-setupResponse ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  ... }
```

The **E-setupResponse** data type has the following components:

a) The **sessionType** component shall identify the session type for the session that has been established and shall have the same value as in the corresponding request.

b) The **sessionId** component shall be an integer that uniquely identifies the session that has been established and shall have the same value as in the corresponding request.

11.1.3 The health setup error content type

An instance of the **health-setup-err** content type shall be used by the responder to complete the establishment of the session.

```
health-setup-err CONTENT-TYPE ::= {
                 E-setupError
  IDENTIFIED BY  id-health-setup-err }
```

The **health-setup-err** content type shall be identified by the object identifier **id-health-setup-err**.

```
E-setupError ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  error       SetupError,
  ... }
```

The **E-setupError** data type has the following components:

a) The **sessionType** component shall identify the session type for the session that failed the establishment and shall have the same value as in the corresponding request.

b) The **sessionId** component shall be an integer that uniquely identifies that failed establishment and shall have the same value as in the corresponding request.

c) The **error** component shall take a value of the **SetupError** data type indicating the reason for the failure.

```
SetupError ::= ENUMERATED {
  setupNotAllowed                (0),
  facilityTemporarilyUnavailable (1),
  facilityPermanentlyUnavailable (2),
  unknownSessionType,            (3),
  sessionTypeNotSupported        (4),
  batchModeNotSupported          (5),
  continuousReturnNotSupported   (6),
  sensorTemporarilyUnavailable   (7),
  sensorPermanentlyUnavailable   (8),
  ... }
```

The **SetupError** data type shall take one of the following values:

a) **setupNotAllowed**: The session initiator is not allowed to initiate a session.

b) **facilityTemporarilyUnavailable**: The responder is temporarily not in a position to establish a session.

c) **facilityPermanentlyUnavailable**: The responder is permanently not in a position to establish a session, i.e., intervention may be required.

d) **unknownSessionType**: The initiator has suggested a session type not known by the responder.

e) **sessionTypeNotSupported**: The initiator has suggested a session type not supported by the responder.

f) **batchModeNotSupported**: The initiator has specified the use of batch mode for return of results. Either the responder does not support the batch mode for return of results or the type of session is not suited for batch transmission of results.

g) **continuousReturnNotSupported**: The initiator has specified use of continuous mode for return of results. Either the responder does not support the continuous mode for return of results or the type of session is not suited for continuous transmission of results.

h) **sensorTemporarilyUnavailable**: The sensor needed for the type of session is temporarily out of service. It is possible to retry the operation after a period. It is a local decision when to retry and how many times to retry.

i) **sensorPermanentUnavailable**: The sensory needed for the type of session has a permanent error that needs attention.

11.2 Session termination

11.2.1 The health terminate request content type

An instance of the **health-terminate-req** content type shall be used by the entity initiating a session termination to request the release of the session.

```
health-term-req CONTENT-TYPE ::= {
                E-terminateRequest
  IDENTIFIED BY id-health-term-req }
```

The **health-terminate-req** content type shall be identified by the **id-health-terminate-req** object identifier.

```
E-terminateRequest ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  ... }
```

The **E-terminateRequest** data type has the following components:

a) The **sessionType** component shall identify the session type for the session to be terminated.

b) The **sessionId** component shall be an integer that uniquely identifies the particular session to be terminated.

When an entity has initiated a session termination, that entity shall stop sending any other message until it has received a response or error to the termination request.

11.2.2 The health terminate response content type

An instance of the **health-terminate-rsp** content type shall be used by the responder of a session termination request to complete the termination.

```
health-term-rsp CONTENT-TYPE ::= {
                E-terminateResponse
  IDENTIFIED BY id-health-term-rsp }
```

The **health-terminate-rsp** content type shall be identified by the **id-health-terminate-rsp** object identifier.

The **E-terminateResponse** data type has the following syntax:

```
E-terminateResponse ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionID,
  ... }
```

The **E-terminateResponse** data type has the following components:

a) The **sessionType** component shall identify the session type for the session that has been terminated and shall have the same value as in the corresponding request.

b) The **sessionId** component shall be an integer that uniquely identifies the session that has been terminated and shall have the same value as in the corresponding request.

When the entity has accepted the termination request, it shall consider the session as terminated and shall discard any subsequent message on that session.

11.2.3 The health terminate error content type

An instance of the **health-terminate-err** content type shall be used by the responder of a session termination to refuse to complete the termination.

```
health-term-err CONTENT-TYPE ::= {
                E-terminateError
  IDENTIFIED BY id-health-term-err }
```

The **health-terminate-err** content type shall be identified by the **id-health-terminate-err** object identifier.

```
E-terminateError ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionID,
  error       TerminateError,
  ... }
```

The **E-terminateError** data type has the following components:

a) The **sessionType** component shall have the same value as in the corresponding request.

b) The **sessionId** component shall have the same value as in the corresponding request.

c) The **error** component shall take a value of the **TerminateError** data type indicating the reason for the failure.

```
TerminateError ::= ENUMERATED {
  terminationNotAllowed,
  invalidSessionType,
  invalidSessionId,
  ... }
```

An instance of the **TerminateError** data type shall take one of the following values:

a) **terminationNotAllowed**: The entity is not allowed to terminate the session.

b) **invalidSessionType**: No session of the type indicated exists.

c) **invalidSessionId**: No session with this identity exists.

Annex A

Formal object identifier allocations

(This annex forms an integral part of this Recommendation.)

This annex provides the formal allocation of top-level OID arcs beneath the **id-telebio** arc.

The object identifiers defined here are basis for the allocation of object identifiers for use in the protocol and for identifying objects, e.g., reflecting the categorization as specified in International Bureau of Weights and Measures (BIPM) ([b-BIPM]).

```
Telebiometrics { joint-iso-itu-t(2) telebiometrics(42) thprot(10) part1(1)
   module(0) oids(0) version1(1) }
DEFINITIONS::=
BEGIN

id-telebio     OBJECT IDENTIFIER ::= { joint-iso-itu-t(2) telebiometrics(42) }

id-thprot                  OBJECT IDENTIFIER ::= { id-telebio thprot(0) }
id-tmm                     OBJECT IDENTIFIER ::= { id-telebio tmm(1) }
id-hum-phys                OBJECT IDENTIFIER ::= { id-telebio human-phy(2) }
id-obj-cat                 OBJECT IDENTIFIER ::= { id-telebio obj-cat(3) }

id-measures                OBJECT IDENTIFIER ::= {id-tmm metric(1)}
id-fields-of-study         OBJECT IDENTIFIER ::= {id-tmm scientific(2)}
id-modalities              OBJECT IDENTIFIER ::= {id-tmm sensory(3)}
-- OIDs for measures
id-quantities              OBJECT IDENTIFIER ::= {id-measures quantities(1)}
id-units                   OBJECT IDENTIFIER ::= {id-measures units(2)}
id-symbols                 OBJECT IDENTIFIER ::= {id-measures symbols(3)}
id-conditions              OBJECT IDENTIFIER ::= {id-measures conditions(4)}
id-methods                 OBJECT IDENTIFIER ::= {id-measures methods(5)}
-- OIDs for quantities
id-quantities-physics      OBJECT IDENTIFIER ::= {id-quantities physics(1)}
id-quantities-chemistry    OBJECT IDENTIFIER ::= {id-quantities chemistry(2)}
id-quantities-biology      OBJECT IDENTIFIER ::= {id-quantities biology(3)}
id-quantities-culturology  OBJECT IDENTIFIER ::= {id-quantities culturology(4)}
id-quantities-psychology   OBJECT IDENTIFIER ::= {id-quantities psychology(5)}
-- OIDs for methods
id-methods-physics         OBJECT IDENTIFIER ::= {id-methods physics(1)}
id-methods-chemistry       OBJECT IDENTIFIER ::= {id-methods chemistry(2)}
id-methods-biology         OBJECT IDENTIFIER ::= {id-methods biology(3)}
id-methods-culturology     OBJECT IDENTIFIER ::= {id-methods culturology(4)}
id-methods-psychology      OBJECT IDENTIFIER ::= {id-methods psychology(5)}
-- OIDs for fields of study
id-physics                 OBJECT IDENTIFIER ::= {id-fields-of-study physics(1)}
id-chemistry               OBJECT IDENTIFIER ::= {id-fields-of-study
                                                  chemistry(2)}
id-biology                 OBJECT IDENTIFIER ::= {id-fields-of-study biology(3)}
id-culturology             OBJECT IDENTIFIER ::= {id-fields-of-study
                                                  culturology(4)}
id-psychology              OBJECT IDENTIFIER ::= {id-fields-of-study
                                                  psychology(5)}
-- OIDs for modalities
id-tango                   OBJECT IDENTIFIER ::= {id-modalities tango(1)}
id-video                   OBJECT IDENTIFIER ::= {id-modalities video(2)}
id-audio                   OBJECT IDENTIFIER ::= {id-modalities audio(3)}
id-chemo                   OBJECT IDENTIFIER ::= {id-modalities chemo(4)}
id-radio                   OBJECT IDENTIFIER ::= {id-modalities radio(5)}
id-calor                   OBJECT IDENTIFIER ::= {id-modalities calor(6)}
id-electro                 OBJECT IDENTIFIER ::= {id-modalities electro(7)}

END
```

Annex B

ASN.1 module for common protocol specifications

(This annex forms an integral part of this Recommendation.)

```
E-health-common { joint-iso-itu-t(2) telebiometrics(42) thprot(10)
    part1(1) module(0) hCommen(1) version1(1) }
DEFINITIONS IMPLICIT TAGS ::=
BEGIN

IMPORTS

  CONTENT-TYPE
    FROM CmsTelebiometric { joint-iso-itu-t(2) telebiometrics(42) thprot(10)
      part0(0) module(0) cmsProfile(1) version1(1) } ;

INTERACTIVE-OPERATION ::= CLASS {
  &id                 INTEGER (0..MAX),
  &content-req        CONTENT-TYPE.&id          OPTIONAL,
  &content-rsp        CONTENT-TYPE.&id          OPTIONAL,
  &content-err        CONTENT-TYPE.&id          OPTIONAL,
  &sessionType        SessionType,
  &requirements       Requirements              DEFAULT none,
  &Voice-options                                OPTIONAL,
  &Video-options                                OPTIONAL,
  &Request,
  &Response                                     OPTIONAL,
  &Error                                        OPTIONAL,
  &exchangeMode       ExchangeMode              DEFAULT async }
WITH SYNTAX {
  OPERATION-ID        &id
  [CONTENT-REQ        &content-req]
  [CONTENT-RSP        &content-rsp]
  [CONTENT-ERR        &content-err]
  SESSION-TYPE        &sessionType
  [REQUIRING          &requirements]
  [VOICE OPTIONS      &Voice-options]
  [VIDEO OPTIONS      &Video-options]
  REQUEST             &Request
  [RESPONSE           &Response]
  [ERROR              &Error]
  [EXCHANGE MODE      &exchangeMode] }

SessionType ::= OBJECT IDENTIFIER

SessionId ::= INTEGER (1..32767)

ExchangeMode ::= ENUMERATED {
  sync      (0),
  async     (1),
  ... }

InteractiveOperations INTERACTIVE-OPERATION ::= { ... }

RequestContent ::= SEQUENCE {
  contentType         INTERACTIVE-OPERATION.&content-req,
  content             SEQUENCE {
    invokId             INTEGER (0..MAX)                        OPTIONAL,
    sessionType         INTERACTIVE-OPERATION.&sessionType,
    sessionId           INTEGER (0..MAX),
    requirement    [0]  INTERACTIVE-OPERATION.&requirements     DEFAULT none,
    voice-options  [1]  INTERACTIVE-OPERATION.&Voice-options    OPTIONAL,
```

```
    video-options [2] INTERACTIVE-OPERATION.&Video-options   OPTIONAL,
    request       [3] INTERACTIVE-OPERATION.&Request,
    exchangeMode  [4] INTERACTIVE-OPERATION.&exchangeMode    DEFAULT sync,
    ... },
  ... }

ResponseContent ::= SEQUENCE {
  contentType   INTERACTIVE-OPERATION.&content-rsp,
  content       SEQUENCE {
    invokId       INTEGER (0..MAX)  OPTIONAL,
    sessionType   INTERACTIVE-OPERATION.&sessionType,
    sessionId     INTEGER (0..MAX),
    response      INTERACTIVE-OPERATION.&Response,
    ... },
  ... }

ErrorContent ::= SEQUENCE {
  contentType   INTERACTIVE-OPERATION.&content-err,
  content       SEQUENCE {
    invokId       INTEGER (0..MAX)  OPTIONAL,
    sessionType   INTERACTIVE-OPERATION.&sessionType,
    sessionId     INTEGER (0..MAX),
    error         INTERACTIVE-OPERATION.&Error,
    ... },
  ... }

-- Object identifier allocation:

id-x1080-1 OBJECT IDENTIFIER ::= { joint-iso-itu-t(2) telebiometrics(42)
telehealth(0) part1(1) }

id-x1080-1-cms-content OBJECT IDENTIFIER ::= { id-x1080-1 cms-content(1) }

-- CMS content types

id-health-setup-req OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-setup-req(1) }
id-health-setup-rsp OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-setup-rsp(2) }
id-health-setup-err OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-setup-err(3) }
id-health-term-req OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-term-req(4) }
id-health-term-rsp OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-term-rsp(5) }
id-health-term-err OBJECT IDENTIFIER ::=
  { id-x1080-1-cms-content health-term-err(6) }

SupportedContentTypes CONTENT-TYPE ::= { ... }

health-setup-req CONTENT-TYPE ::= {
                 E-setupRequest
  IDENTIFIED BY  id-health-setup-req }

E-setupRequest ::= SEQUENCE {
  sessionType      SessionType,
  sessionId        SessionId,
  requirement  [0] Requirements  DEFAULT none,
  voiceOptions [1] VoiceOptions  OPTIONAL,
  videoOptions [2] VideoOptions  OPTIONAL,
  returnMode       ReturnMode,
  sensorId         UTF8String  OPTIONAL,
  operations       SET SIZE (1..MAX) OF
    INTERACTIVE-OPERATION.&id ({SupportedOperationTypes}),
```

```
  first             INTERACTIVE-OPERATION.&id ({SupportedOperationTypes})
                      OPTIONAL,
  ... }

InvokeId ::= INTEGER (1..MAX) -- used by other modules

Requirements ::= ENUMERATED {
  none                                (0),
  with-2-way-voice                    (1),
  with-reverse-video-and-2-way-voice  (2),
  with-2-way-video-and-voice          (3),
  ... }

VoiceOptions ::= OBJECT IDENTIFIER

VideoOptions ::= OBJECT IDENTIFIER

ReturnMode ::= ENUMERATED {
  continuous,
  batch,
  ... }

SupportedOperationTypes INTERACTIVE-OPERATION ::= {...}

health-setup-rsp CONTENT-TYPE ::= {
                 E-setupResponse
  IDENTIFIED BY  id-health-setup-rsp }

E-setupResponse ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  ... }

health-setup-err CONTENT-TYPE ::= {
                 E-setupError
  IDENTIFIED BY  id-health-setup-err }

E-setupError ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  error       SetupError,
  ... }

SetupError ::= ENUMERATED {
  setupNotAllowed,
  facilityTemporarilyUnavailable,
  facilityPermanentlyUnavailable,
  unknownSessionType,
  sessionTypeNotSupported,
  batchModeNotSupported,
  continuousReturnNotSupported,
  sensorTemporarilyUnavailable,
  sensorPermanentlyUnavailable,
  ... }

health-term-req CONTENT-TYPE ::= {
                E-terminateRequest
  IDENTIFIED BY id-health-term-req }

E-terminateRequest ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  ... }
```

```
health-term-rsp CONTENT-TYPE ::= {
                E-terminateResponse
  IDENTIFIED BY id-health-term-rsp }

E-terminateResponse ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  ... }

health-term-err CONTENT-TYPE ::= {
                E-terminateError
  IDENTIFIED BY id-health-term-err }

E-terminateError ::= SEQUENCE {
  sessionType SessionType,
  sessionId   SessionId,
  error       TerminateError,
  ... }

TerminateError ::= ENUMERATED {
  terminationNotAllowed,
  invalidSessionType,
  invalidSessionId,
  ... }

END -- E-health-common
```

Annex C

Identification of objects

(This annex forms an integral part of this Recommendation.)

```
E-health-identification
{ joint-iso-itu-t(2) telebiometrics(42) thprot(10) part1(1)
      module(0) id-telehelth(2) version1(1) }

DEFINITIONS AUTOMATIC TAGS::=
BEGIN

IMPORTS

  id-thprot, id-obj-cat
    FROM Telebiometrics { joint-iso-itu-t(2) telebiometrics(42) thprot(10)
part1(1)
      module(0) oids(0) version1(1) } ;

-- Allocation of object identifiers:

id-x1080-1 OBJECT IDENTIFIER ::= { id-thprot part1(1) }

id-x1080-1-modules     OBJECT IDENTIFIER ::= { id-x1080-1 module(0) }

id-x1080-1-cms-content OBJECT IDENTIFIER ::= { id-x1080-1 cms-content(1) }

-- Object categories

id-patient      OBJECT IDENTIFIER ::= { id-obj-cat patient(1) }
id-med-staff    OBJECT IDENTIFIER ::= { id-obj-cat med-staff(2) }
id-observer     OBJECT IDENTIFIER ::= { id-obj-cat observer(3) }
id-pharm-staff  OBJECT IDENTIFIER ::= { id-obj-cat pharm-staff(4) }
id-lab          OBJECT IDENTIFIER ::= { id-obj-cat lab(5) }
id-drug-manufac OBJECT IDENTIFIER ::= { id-obj-cat drug-manufac(6) }
id-med-device   OBJECT IDENTIFIER ::= { id-obj-cat med-device(7) }
id-med-softw    OBJECT IDENTIFIER ::= { id-obj-cat med-softw(8) }
id-med-insur    OBJECT IDENTIFIER ::= { id-obj-cat med-insur(9) }
id-med-rec      OBJECT IDENTIFIER ::= { id-obj-cat med-rec(10) }

-- Identification of object categories

IDENTIFICATION ::= CLASS {
  &category       OBJECT IDENTIFIER UNIQUE,
  &Identification }
WITH SYNTAX {
  CATEGORY        &category
  IDENTIFIED WITH &Identification }

Identification ::= SEQUENCE {
  category       IDENTIFICATION.&category({Categories}),
  identification IDENTIFICATION.&Identification({Categories}{@category}) }

Categories IDENTIFICATION ::= {
  patientIdentification |
  medicalStaffIdentification |
  observerIdentification |
  pharmaceuticalStaffIdentification |
  laboratoryIdentification |
  manufacturerIdentification |
  deviceIdentification |
  softwareIdentification |
```

```
  insuranceIdentification |
  medicalRecordIdentification,
  ... }

patientIdentification   IDENTIFICATION ::= {
  CATEGORY        id-patient
  IDENTIFIED WITH PatientIdentification }

PatientIdentification ::= SEQUENCE {
  scheme         PATIENT-SCHEME.&id ({PatientSchemes}),
  schemeName     PATIENT-SCHEME.&name ({PatientSchemes}{@.scheme}) OPTIONAL,
  patientId      PATIENT-SCHEME.&Identification ({PatientSchemes}{@.scheme}) }

PATIENT-SCHEME ::= CLASS {
  &id            OBJECT IDENTIFIER UNIQUE,
  &name          SchemeName OPTIONAL,
  &Identification }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification }

SchemeName ::= CHOICE {
  string   ISO646String,
  oid      OBJECT IDENTIFIER,
  ... }

PatientSchemes PATIENT-SCHEME ::= {...}

medicalStaffIdentification IDENTIFICATION ::= {
  CATEGORY         id-med-staff
  IDENTIFIED WITH  MedicalStaffIdentification }

MedicalStaffIdentification ::= SEQUENCE {
  scheme           MEDICAL-STAFF-SCHEME.&id ({MedicalStaffSchemes}),
  schemeName       MEDICAL-STAFF-SCHEME.&name
                   ({MedicalStaffSchemes}{@.scheme}) OPTIONAL,
  medicalStaffId   MEDICAL-STAFF-SCHEME.&Identification
                   ({MedicalStaffSchemes}{@.scheme}),
  qualifications   MEDICAL-STAFF-SCHEME.&Qualifications
                  ({MedicalStaffSchemes}{@.scheme}) OPTIONAL}

MEDICAL-STAFF-SCHEME ::= CLASS {
  &id               OBJECT IDENTIFIER UNIQUE,
  &name             SchemeName OPTIONAL,
  &Identification,
  &Qualifications,
  &Observer }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id USING &Identification
  WITH &Qualifications AND &Observer }

MedicalStaffSchemes MEDICAL-STAFF-SCHEME ::= {...}

observerIdentification  IDENTIFICATION ::= {
  CATEGORY        id-observer
  IDENTIFIED WITH ObserverIdentification }

ObserverIdentification ::= SEQUENCE {
  scheme       MEDICAL-STAFF-SCHEME.&id ({MedicalStaffSchemes}),
  schemeName   MEDICAL-STAFF-SCHEME.&name ({MedicalStaffSchemes}{@.scheme})
               OPTIONAL,
  observerId   MEDICAL-STAFF-SCHEME.&Observer ({MedicalStaffSchemes}{@.scheme})}

pharmaceuticalStaffIdentification IDENTIFICATION ::= {
  CATEGORY        id-pharm-staff
```

```
  IDENTIFIED WITH PharmaceuticalStaffIdentification }

PharmaceuticalStaffIdentification ::= SEQUENCE {
  scheme          MEDICAL-STAFF-SCHEME.&id ({MedicalStaffSchemes}),
  schemeName      MEDICAL-STAFF-SCHEME.&name ({MedicalStaffSchemes}{@.scheme})
OPTIONAL,
  medicalStaffId  MEDICAL-STAFF-SCHEME.&Identification
({MedicalStaffSchemes}{@.scheme}),
  qualifications  MEDICAL-STAFF-SCHEME.&Qualifications
({MedicalStaffSchemes}{@.scheme}) OPTIONAL}

laboratoryIdentification IDENTIFICATION ::= {
  CATEGORY        id-lab
  IDENTIFIED WITH LaboratoryIdentification }

LaboratoryIdentification ::= SEQUENCE {
  scheme          LABORATORY-SCHEME.&id ({LaboratorySchemes}),
  schemeName      LABORATORY-SCHEME.&name ({LaboratorySchemes}{@.scheme})
                  OPTIONAL,
  qualifications LABORATORY-SCHEME.&Qualifications
                  ({LaboratorySchemes}{@.scheme}) OPTIONAL}

LABORATORY-SCHEME ::= CLASS {
  &id          OBJECT IDENTIFIER UNIQUE,
  &name        SchemeName    OPTIONAL,
  &Qualifications }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id WITH &Qualifications }

LaboratorySchemes LABORATORY-SCHEME ::= {...}

manufacturerIdentification IDENTIFICATION ::= {
  CATEGORY        id-drug-manufac
  IDENTIFIED WITH ManufacturerIdentification }

ManufacturerIdentification ::= SEQUENCE {
  scheme          MANUFACTURER-SCHEME.&id ({ManufacturerSchemes}),
  schemeName      MANUFACTURER-SCHEME.&name ({ManufacturerSchemes}{@.scheme})
OPTIONAL,
  manufacturerId MANUFACTURER-SCHEME.&Manufacturer
({ManufacturerSchemes}{@.scheme}),
  drugId          MANUFACTURER-SCHEME.&Drug ({ManufacturerSchemes}{@.scheme})}

MANUFACTURER-SCHEME ::= CLASS {
  &id            OBJECT IDENTIFIER UNIQUE,
  &name          SchemeName OPTIONAL,
  &Manufacturer,
  &Drug }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
  PRODUCING &Drug }

ManufacturerSchemes MANUFACTURER-SCHEME ::= {...}

DEVICE-SCHEME ::= CLASS {
  &id                  OBJECT IDENTIFIER UNIQUE,
  &name                SchemeName OPTIONAL,
  &Manufacturer,
  &Device,
  &supportedFormats    Supported-formats }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
  PRODUCING &Device SUPPORTING &supportedFormats}
```

```
Supported-formats ::= CHOICE {
  oids  SEQUENCE OF OBJECT IDENTIFIER,
  ... }

deviceIdentification IDENTIFICATION ::= {
  CATEGORY        id-med-device
  IDENTIFIED WITH DeviceIdentification }

DeviceIdentification ::= SEQUENCE {
  scheme         DEVICE-SCHEME.&id({DeviceSchemes}),
  schemeName     DEVICE-SCHEME.&name ({DeviceSchemes}{@.scheme}) OPTIONAL,
  manufacturerId DEVICE-SCHEME.&Manufacturer ({DeviceSchemes}{@.scheme})
                   OPTIONAL,
  device         DEVICE-SCHEME.&Device ({DeviceSchemes}{@.scheme}),
  formats        DEVICE-SCHEME.&supportedFormats ({DeviceSchemes}{@.scheme})}

DeviceSchemes DEVICE-SCHEME ::= {...}

softwareIdentification  IDENTIFICATION ::= {
  CATEGORY        id-med-softw
  IDENTIFIED WITH SoftwareIdentification }

SOFTWARE-SCHEME ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
  &name         SchemeName OPTIONAL,
  &Manufacturer,
  &Software }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Manufacturer
  PRODUCING &Software }

SoftwareIdentification ::= SEQUENCE {
  scheme         SOFTWARE-SCHEME.&id({SoftwareSchemes}),
  schemeName     SOFTWARE-SCHEME.&name ({SoftwareSchemes}{@.scheme}) OPTIONAL,
  manufacturerId SOFTWARE-SCHEME.&Manufacturer ({SoftwareSchemes}{@.scheme})
                   OPTIONAL,
  software       SOFTWARE-SCHEME.&Software ({SoftwareSchemes}{@.scheme})}

SoftwareSchemes    SOFTWARE-SCHEME ::= {...}

insuranceIdentification IDENTIFICATION ::= {
  CATEGORY        id-med-insur
  IDENTIFIED WITH InsuranceIdentification }

InsuranceIdentification ::= SEQUENCE {
  scheme         INSURANCE-SCHEME.&id({InsuranceSchemes}),
  schemeName     INSURANCE-SCHEME.&name ({InsuranceSchemes}{@.scheme}) OPTIONAL,
  manufacturerId INSURANCE-SCHEME.&Company ({InsuranceSchemes}{@.scheme}),
  insurance      INSURANCE-SCHEME.&InsuranceType ({InsuranceSchemes}{@.scheme}),
  insuranceCert  INSURANCE-SCHEME.&Certification ({InsuranceSchemes}{@.scheme})}

INSURANCE-SCHEME ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
  &name         SchemeName OPTIONAL,
  &Company,
  &InsuranceType,
  &Certification }
WITH SYNTAX {
  SCHEME [NAME &name] IDENTIFIED BY &id FOR &Company
  USING &InsuranceType CERTIFIED WITH &Certification }

InsuranceSchemes INSURANCE-SCHEME ::= {...}

medicalRecordIdentification IDENTIFICATION ::= {
```

```
  CATEGORY        id-med-rec
  IDENTIFIED WITH MedicalRecordIdentification }

MedicalRecordIdentification ::= SEQUENCE {
  scheme       MEDICAL-RECORD-SCHEME.&id ({MedicalRecordSchemes}),
  schemeName   MEDICAL-RECORD-SCHEME.&name ({MedicalRecordSchemes}{@.scheme})
OPTIONAL,
  definingOrg  MEDICAL-RECORD-SCHEME.&Organisation
({MedicalRecordSchemes}{@.scheme}),
  recordType   MEDICAL-RECORD-SCHEME.&RecordType
({MedicalRecordSchemes}{@.scheme}),
  record       MEDICAL-RECORD-SCHEME.&Record ({MedicalRecordSchemes}{@.scheme})}

MEDICAL-RECORD-SCHEME ::= CLASS {
  &id           OBJECT IDENTIFIER UNIQUE,
  &name         SchemeName OPTIONAL,
  &Organisation,
  &RecordType,
  &Record }
WITH SYNTAX {
  SCHEME
  [NAME         &name]
  IDENTIFIED BY &id
  FOR           &Organisation
  USING         &RecordType
  WITH FORMAT   &Record }

MedicalRecordSchemes    MEDICAL-RECORD-SCHEME ::= {...}

END -- E-health-identification
```

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