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Next Generation Networks – Frameworks and functional
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Service and capability requirements for e-health monitoring services

Recommendation ITU-T Y.2065



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GLOBAL INFORMATION INFRASTRUCTURE

General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899

INTERNET PROTOCOL ASPECTS

General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
IPTV over NGN	Y.1900–Y.1999

NEXT GENERATION NETWORKS

Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Enhancements to NGN	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Packet-based Networks	Y.2600–Y.2699
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899
Carrier grade open environment	Y.2900–Y.2999
FUTURE NETWORKS	Y.3000–Y.3499
CLOUD COMPUTING	Y.3500–Y.3999

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Recommendation ITU-T Y.2065

Service and capability requirements for e-health monitoring services

Summary

Recommendation ITU-T Y.2065 provides service and capability requirements for e-health monitoring services.

Three classes of e-health monitoring services, including their general and specific characteristics, are described. Service requirements for the support of e-health monitoring services are also described, and based on the identified service requirements, the capability requirements are specified.

History

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Table of Contents

Page

1	Scope	1
2	References.....	1
3	Definitions	1
3.1	Terms defined elsewhere	1
3.2	Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	2
5	Conventions	3
6	Classification of e-health monitoring services	3
6.1	EHM healthcare (EHMH) services	4
6.2	EHM rehabilitation (EHMR) services.....	4
6.3	EHM treatment (EHMT) services	4
7	Characteristics of e-health monitoring services.....	4
7.1	General characteristics.....	4
7.2	Specific characteristics of EHM services	5
8	Service requirements for support of e-health monitoring services.....	6
8.1	EHM roles	6
8.2	Service requirements of EHM customers.....	7
8.3	Service requirements of an EHM device provider	8
8.4	Service requirements of a network provider	9
8.5	Service requirements of a platform provider.....	9
8.6	Service requirements of an EHM application provider	10
9	Capability requirements for support of e-health monitoring services	10
9.1	Introduction to the EHM capabilities	10
9.2	Capabilities of the application layer.....	11
9.3	Capabilities of the SSAS layer	12
9.4	Capabilities of the network layer.....	14
9.5	Capabilities of the device layer	14
9.6	Management capabilities	15
9.7	Security capabilities.....	17
Appendix I – e-health monitoring service scenarios.....		19
I.1	Individual/family (indoor and outdoor).....	19
I.2	Physical examination.....	20
I.3	Disaster rescue.....	22
I.4	Pre-hospital emergency medical service	24
I.5	Smart ward service	27
I.6	Chronic disease care	28

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Recommendation ITU-T Y.2065

Service and capability requirements for e-health monitoring services

1 Scope

This Recommendation describes the service requirements for the support of e-health monitoring services, and it specifies the corresponding capability requirements.

The scope of this Recommendation includes:

- classification of e-health monitoring services;
- description of characteristics of e-health monitoring services;
- service requirements for supporting e-health monitoring services;
- capability requirements for supporting e-health monitoring services.

Relevant service scenarios of e-health monitoring services are provided in Appendix I.

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 Y.2060] Recommendation ITU-T Y.2060 (2012), *Overview of the Internet of things*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 device [ITU-T Y.2060]: With regard to the Internet of things, this is a piece of equipment with the mandatory capabilities of communication and the optional capabilities of sensing, actuation, data capture, data storage and data processing.

3.1.2 Internet of things (IoT) [ITU-T Y.2060]: A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

NOTE 1 – Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled.

NOTE 2 – From a broader perspective, the IoT can be perceived as a vision with technological and societal implications.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 e-health monitoring (EHM) service: A service which consists of observing and recording information based on a customer's physiological data, environmental data and other data, with the aim of monitoring the customer's state of health through the use of information and communication technologies.

3.2.2 e-health monitoring healthcare (EHMH) service: A class of EHM services providing the customer with health monitoring services for a 'healthy' state.

3.2.3 e-health monitoring rehabilitation (EHMR) service: A class of EHM services providing the customer with health monitoring services for a 'not fully healthy' or 'in recovery' state of health.

3.2.4 e-health monitoring treatment (EHMT) service: A class of EHM services providing the customer with health monitoring services for an 'illness' state of health.

3.2.5 EHM system: A set of hardware and software components which constitute as a whole the technical chain of e-health monitoring (EHM) service provisioning.

NOTE – EHM systems include EHM devices, gateways, networks, service support platforms and EHM applications.

3.2.6 EHM device: A device, as defined in [ITU-T Y.2060], which has sufficient qualification for e-health monitoring (EHM) service provisioning.

NOTE – Examples include EHM devices for EHMH (i.e., EHM devices which have sufficient qualification for EHMH), EHM devices for EHMT and EHM devices for EHMR.

3.2.7 EHM terminal: An e-health monitoring (EHM) device directly connected to the communication network.

3.2.8 EHM end point: An e-health monitoring (EHM) device connected to the communication network through gateway(s).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CT	Computed Tomography
ECG	Electrocardiogram
EHM	e-health Monitoring
EHMH	e-health Monitoring Healthcare
EHMR	e-health Monitoring Rehabilitation
EHMT	e-health Monitoring Treatment
EMR	Electronic Medical Record
EMSS	Emergency Medical Service System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
ICT	Information and Communication Technology
IP	Internet Protocol
IoT	Internet of Things

MRI	Magnetic Resonance Imaging
PDA	Personal Digital Assistant
PEMS	Pre-hospital Emergency Medical Service
QoS	Quality of Service
RFID	Radio Frequency Identification
SSAS	Service Support and Application Support
UMTS	Universal Mobile Telecommunications System
WAN	Wide Area Network
WSN	Wireless Sensor Network

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

The keywords "can optionally" and "may" indicate an optional requirement which is permissible, without implying any sense of being recommended. These terms are not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6 Classification of e-health monitoring services

This clause introduces a classification of e-health monitoring (EHM) services. The main purpose of this classification is to simplify the analysis of service network requirements and capability requirements for the support of EHM services.

For this classification of EHM services, two factors are considered: completeness and independency. Completeness means that the identified classes of EHM services cover all possible EHM services. Independency means that the identified classes of EHM services do not overlap with each other; in other words, each class has unique features specific to the EHM services of that class.

In this classification, human health is seen in one of four possible states: healthy, in recovery, not fully healthy, and illness. Each state has some service requirements which are unique to that state. These four states can be mapped into three EHM service classes which meet the two factors of completeness and independency: EHM healthcare, EHM rehabilitation and EHM treatment. Figure 6-1 shows these four human states of health and the corresponding EHM service classes.

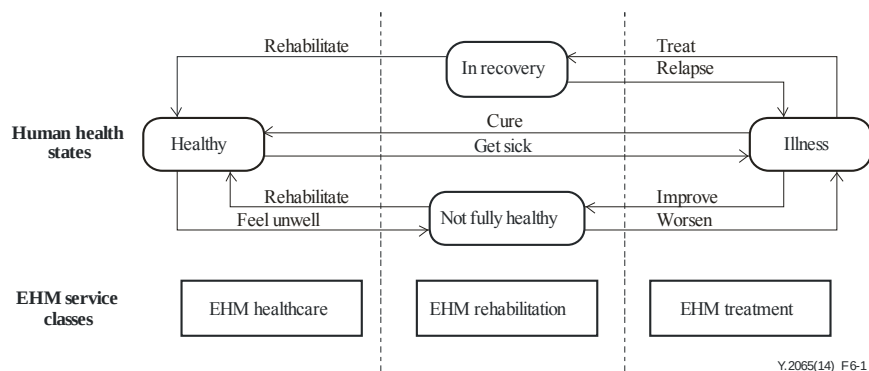


Figure 6-1 – Human states of health and corresponding EHM service classes

NOTE 1 – These EHM service classes have different characteristics, e.g., in terms of the number and type of target customers, target customers' mobility and the timing of service feedback to customers. Different service requirements are identified for each class.

NOTE 2 – EHM service classification does not sufficiently address health emergency situations. In such situations, there are a large number of requirements to be satisfied which are beyond the specific scope of e-health monitoring services.

6.1 EHM healthcare (EHMH) services

The target people of EHMH services are those in good health (healthy) but who pay close attention to their health status or those who still require some attention in that they are potentially at risk of getting diseases.

NOTE – EHMH services are usually provided by social and commercial organizations offering daily health-care services to people without on-site care.

6.2 EHM rehabilitation (EHMR) services

The target people of EHMR services include people with chronic diseases (not fully healthy state of health), and others who need on-site care (in recovery state of health).

NOTE – EHMR services may be provided by qualified organizations, such as rehabilitation centres, physical examination agencies, community medical stations and so on.

6.3 EHM treatment (EHMT) services

The target people of EHMT services include those who are hospitalized (illness state of health) and need medical services.

NOTE – EHMT services may be provided by qualified professional organizations, e.g., hospitals, medical emergency centres and so on.

7 Characteristics of e-health monitoring services

7.1 General characteristics

7.1.1 A class of services exploiting the capabilities of the IoT

EHM services exploit the identification, data capture, data processing and communication capabilities of the IoT [ITU-T Y.2060] to monitor customers' health, whilst maintaining the required privacy.

EHM services involve capabilities at all layers of the IoT reference model [ITU-T Y.2060], i.e., at the device layer, network layer, service support and application support layer and the application layer, whilst having some unique service requirements and capability requirements with respect to other classes of services which are exploiting the capabilities of the IoT.

7.1.2 Support of data sharing

The data generated by EHM services can be shared among different EHM services according to regulations, laws and other requirements.

7.1.3 Enhanced value via service support and application support layer capabilities

The service support and application support layer [ITU-T Y.2060] is key to the infrastructure of the IoT. Based on the capabilities of the service support and application support layer, the capabilities of the EHM services, e.g., data sharing and data communication, are enhanced in terms of efficiency, reliability and safety.

7.1.4 Enhanced value via network layer capabilities

In order to support customer access to EHM services remotely and locally, the network acts as a data transmission channel.

Based on the network layer capabilities, e.g., policy-based communication, network-based locating and network resource provisioning, the capabilities of EHM services are enhanced, e.g., in terms of network intelligence.

7.1.5 Combination of health-related technology and ICT

EHM services make use of both health monitoring-related technologies and information and communication technologies (ICTs); this implies that EHM services have to comply not only with ICT technical specifications but also with health-related specifications.

7.1.6 Multiple EHM devices serving one single user

Multiple EHM devices can serve one single user in a collaborative way.

Many EHM devices have a single function. For example, a blood pressure monitor measures blood pressure but it does not collect other physical health signals, such as ECG information, blood-oxygen levels, information on posture and so on. This implies that multiple EHM devices may be associated with one single user in a collaborative way to gather health information.

7.1.7 Users with different accessibility needs

Since EHM services address people with different accessibility needs, they have to be capable of meeting those needs accordingly.

7.1.8 Regulated services

Various EHM service aspects, including device, application and other aspects, are regulated by specific entities according to regulation and laws. Different types of EHM services may need to follow different regulation policies.

7.2 Specific characteristics of EHM services

7.2.1 Characteristics of EHM healthcare services

1) Service and network scalability

Compared to EHMT and EHMR services, the number of service providers and customers involved with EHMH services may be very large, as there are less professional and administrative constraints associated with these services. Consequently, service and network scalability is a key concern.

2) Wide service coverage

The EHMH users may access the services from a wide range of locations including home, school, office, train, vehicles and so on.

3) Data transmission with high reliability requirements and weak latency constraints

EHMH services need data transmission with high reliability but which also allows high latency.

- Data of EHMH services are transmitted without faults.
- EHMH services have weaker latency constraints than EHMT and EHMR services.

4) Unguaranteed support of clinical intervention

The EHMH services do not guarantee support of clinical intervention for customers.

7.2.2 Characteristics of EHM rehabilitation services

1) Access to data produced by EHMT and EHMH services

EHMR services may benefit from accessing data which have been produced by EHMH and EHMT services.

2) Restricted service coverage

EHMR services may be provided to users in qualified locations.

NOTE 1 – Inside qualified service buildings, users can usually obtain EHMR services with full capabilities. In other locations, users may access EHMR services with partial capabilities.

3) Support of clinical intervention

EHMR services provide support for clinical intervention to users.

4) Data transmission with high reliability requirements and medium latency constraints

EHMR services need data transmission with high reliability and which allows medium latency.

- Data of EHMR services are transmitted without faults.
- EHMR services have a stricter latency requirement than EHMH services, but a looser latency requirement than EHMT services.

7.2.3 Characteristics of EHM treatment services

1) Centralized management

EHMT services have usually centralized management inside organizations providing these services.

2) Medical imaging

Medical imaging devices used in EHMT services, such as CT, MRI, ultrasonic devices and so on, usually generate big data streams.

- Big data streams are generated among departments inside a hospital or among hospitals, as well as between hospital and emergency cars, and between disaster sites and hospital or emergency cars.

3) Data transmission with high reliability and low latency requirements

EHMT services need data transmission with high reliability and low latency requirements.

- EHMT services have the highest requirements of latency compared to EHMH and EHMR services.

8 Service requirements for support of e-health monitoring services

8.1 EHM roles

The roles participating in EHM services include EHM customer, EHM device provider, network provider, platform provider and EHM application provider.

These EHM roles can be mapped to the IoT business roles introduced in Appendix I of [ITU-T Y.2060], as shown in Figure 8-1.